Commonwealth Mycological Institute
4 September, 1951

THE

Tea Research Institute

OF

Ceylon

BULLETIN No. 31

Annual Report for the Year 1949

Published by
THE TEA RESEARCH INSTITUTE OF CEYLON,
ST. COOMBS, TALAWAKELLE, CEYLON,
1951.

The Tea Research Institute of Ceylon

SCIENTIFIC STAFF

AT 1-1-1949

Director	...	Roland V. Norris, D.Sc. (Lond.), M.Sc. (Manc.), F.R.I.C.
Department of Plant Pathology.		
Pathologist and Deputy Director	...	C. H. Gadd, D.Sc. (Birm.)
Mycologist	...	D. R. Kemp, B.Sc. (Lond.)
Assistant Entomologist	...	G. D. Austin
Research Assistant	...	C. A. Loos
Assistants	...	D. J. W. Ranaweera
		W. T. Fonseka
		S. N. VanderWal
Department of Agricultural Chemistry.		
Agricultural Chemist	...	T. Eden, D.Sc. (Manc.), A.R.I.C.
Assistant	...	E. N. Perera
Field Assistants	...	M. Piyasena
		F. P. Jayawardana
Department of Biochemistry.		
Biochemist	...	J. Lamb, M.Sc. (Lond.), A.R.I.C., A.I.C.T.A.
Research Assistant	...	M. S. Ramaswamy, B.Sc. (Mysore), A.I.I.Sc.
Assistants	...	E. L. Keegel
		V. Mendis
		S. M. Gunaratnam
Department of Plant Physiology.		
Plant Physiologist	...	G. B. Portsmouth, B.Sc. (Lond.), A.R.C.S., D.I.C.
Assistants		F. H. Kehl
		E. S. Rajiah
Small-Holdings Officers.		
		R. L. Illankoon
		F. D. Tillekeratne
		K. P. Abeyawickrema
Superintendent, St. Coombs Estate	...	F. C. Daniel

NOTE

The Laboratories of the Institute are situated at St. Coombs Estate, Talawakelle, and letters and enquiries should be addressed to the Director, Tea Research Institute of Ceylon, St. Coombs, Talawakelle. Telegraphic Address:—Research, Talawakelle, Telephone, Talawakelle 44 (Private Exchange). It is particularly requested that letters should not be addressed to officers by name.

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TWENTY-FOURTH ANNUAL REPORT OF THE BOARD OF THE TEA RESEARCH INSTITUTE OF CEYLON FOR THE YEAR 1949

Foundation. The Tea Research Institute of Ceylon was established by Ordinance No. 12 of 1925 dated 27th October, 1925, and amended by the Tea Research (Amendment) Act, No. 24 of 1948 dated 20th December, 1948. The personnel constituting the Board on the 1st day of January, 1949, was :—

Ex-Officio Members

The Director of Agriculture (Mr. D. Rhind).

The Hon'ble the Financial Secretary (Represented by Mr. T. D. Perera, C.C.S., Acting Secretary to the Treasury).

The Chairman, Planters' Association of Ceylon (Mr. W. A. Paterson).

The Chairman, Agency Section of the Planters' Association of Ceylon (Mr. W. H. Gourlay)

Representatives of the Planters' Association of Ceylon.

Mr. R. C. Scott, C.B.E.

Mr. H. S. Hurst.

Mr. W. W. A. Phillips.

Representatives of the Agency Section of the Planters' Association of Ceylon.

Mr. J. C. Kelly.

Mr. W. H. Attfield.

Mr. F. A. Bond.

Representatives of the Low-Country Products Association.

Mr. W. Neal de Alwis, J.P., U.M.

Representatives of the Small Holders.

Mr. S. Vytilingam.

Chairman.—Mr. R. C. Scott, C.B.E.

Secretary.—Dr. Roland V. Norris, D.Sc., F.R.I.C.

Solicitors.—Messrs. Julius & Creasy.

Auditors.—Messrs. Ford, Rhodes, Thornton & Co.

Registered Office.—St. Coombs Estate, Talawakelle.

The following changes in the composition of the Board took place during the year :—

Mr. C. E. Jones, C.M.G., C.C.S., returned from leave on 7th January, 1949, and resumed his seat on the Board as representative of the Treasury. He relieved Mr. T. D. Perera, C.C.S., who had been acting for him.

Mr. Leo B. de Mel, J.P., U.M. and Mr. Errol Jayawickreme were nominated by the Low-Country Products Association on 20th January, 1949, as their representatives for the two additional seats allotted to them.

Mr. E. G. Groves became an ex-officio member of the Board as from the 25th March, 1949, on his election to the Chairmanship of the Planters' Association of Ceylon. He replaced Mr. W. A. Paterson.

Mr. R. C. Scott, C.B.E., (Chairman) proceeded on leave as from 1st April 1949, Mr. H. S. Hurst was elected to act as Chairman during his absence and Mr. D. S. Sutherland was nominated by the Planters' Association of Ceylon to act for Mr. Scott on the Board.

Mr. W. H. Attfield was renominated by the Agency Section of the Planters' Association of Ceylon to serve on the Board for a further period of three years with effect from 10th April, 1949.

Mr. W. W. A. Phillips resigned his seat on the 30th June, 1949, preparatory to his departure from Ceylon and Mr. H. de T. Wilkinson Kay was nominated by the Planters' Association to take his place with effect from 1st July, 1949.

Mr. E. E. Spencer succeeded Mr. W. H. Gourlay as an ex-officio member on his assuming the Chairmanship of the Agency Section of the Planters' Association on 16th July, 1949.

Mr. E. N. Ewart was nominated by the Agency Section of the Planters' Association on 5th September, 1949, to act for Mr. F. A. Bond who had proceeded on leave.

Mr. V. G. W. Ratnayake, M.P., was nominated by the Minister of Agriculture and Lands to serve on the Board as the representative of the small holders as from 14th October, 1949. He took the place of Mr. S. Vytilingam whose period of nomination had expired on the 15th October, 1949.

Mr. R. J. Hartley replaced Mr. E. E. Spencer as an ex-officio member of the Board when he assumed the Chairmanship of the Agency Section of the Planters' Association of Ceylon on 5th November, 1949. He, however, resigned the above post on 31st December, 1949, and ceased to be a member of the Board.

Dr. Roland V. Norris, the Director and Secretary to the Board, left Ceylon, on leave on 13th of November, 1949. He was succeeded by Mr. J. Lamb, the Acting Director.

Four Meetings of the Board were held during the year on 26th March, 29th July, 15th November and 20th December.

Committees.

Finance Sub-Committee. The Chairman, The Tea Research Institute of Ceylon (Mr. R. C. Scott, C.B.E.,); The Chairman, Planters' Association of Ceylon (Mr. W. A. Paterson); The Chairman, Agency Section of the Planters' Association of Ceylon (Mr. W. H. Gourlay); Messrs. H. S. Hurst, W. H. Attfield, J. C. Kelly and the Director, Tea Research Institute of Ceylon (Dr. Roland V. Norris, D.Sc., F.R.I.C.).

Mr. E. G. Groves replaced Mr. W. A. Paterson when he became Chairman of the Planters' Association of Ceylon on 25th March, 1949.

Mr. H. S. Hurst acted for Mr. R. C. Scott, C.B.E., when he proceeded on leave with effect from 1st July, 1949.

Mr. E. E. Spencer replaced Mr. W. H. Gourlay when he became Chairman of the Agency Section of the Planters' Association of Ceylon on 16th July, 1949.

Mr. R. J. Hartley took Mr. E. E. Spencer's place when he became Chairman of the Agency Section of the Planters' Association of Ceylon on 5th November, 1949, but resigned on 31st December, 1949.

Two meetings of the Committee were held on the 29th July, 1949, and 20th December, 1949.

Estate and Experimental Sub-Committee. The Director, Tea Research Institute of Ceylon (Chairman). The Chairman, Tea Research Institute of Ceylon (Mr. R. C. Scott, C.B.E.); The Visiting Agent, St. Coombs Estate (Mr. A. H. Hall), The Superintendent, St. Coombs Estate (Mr. F. C. Daniel); Messrs. H. S. Hurst, P. B. Cruickshank, F. A. Bond, C. R. Lawson, R. H. Horne, G. K. Newton, S. Bolster, and Dr. T. Eden (Convener).

Messrs. A. H. Hall, the Visiting Agent, and R. H. Horne proceeded on leave during the course of the year. Their places were taken by Mr. Sydney Bolster, who acted as the Visiting Agent and Mr. T. Kane respectively.

Mr. Sydney Bolster was elected to fill the place of Mr. H. S. Hurst when he (Mr. Hurst) assumed the Acting Chairmanship of the Board on Mr. R. C. Scott's departure on leave.

Three meetings of the Committee were held on 18th June, 1949, 5th November, 1949, and 10th December, 1949.

Low-Country Sub-Station Sub-Committee. The following were elected as members of this Committee at the meeting of the Board of the Tea Research Institute held on 15th November, 1949:—

Messrs. V. G. W. Ratnayake, M.P., Leo B. de Mel, J.P., U.M., W. Neal de Alwis, J.P., U.M., and J. Lamb (Acting Director).

Committee of Management, Junior Staff Medical Scheme. The Chairman, Tea Research Institute of Ceylon (Mr. R. C. Scott, C.B.E.); The Director, Tea Research Institute of Ceylon (Dr. Roland V. Norris) and Mr. G. D. Austin (representing the Junior Staff Association, T.R.I.).

Mr. H. S. Hurst acted for Mr. R. C. Scott, C.B.E., the Chairman, during his absence on leave.

Trustees of the Junior Staff Provident Fund. The Chairman, Tea Research Institute of Ceylon (Mr. R. C. Scott, C.B.E.); The Director, Tea Research Institute of Ceylon; Mr. J. C. Kelly and Mr. E. N. Perera representing the Junior Staff.

Mr. H. S. Hurst took Mr. R. C. Scott's place when he proceeded on leave.

Mr. R. Singleton-Salmon was elected to fill the vacancy caused by the resignation of Mr. J. C. Kelly with effect from 15th November, 1949.

Visiting Agent, St. Coombs Estate. Mr. A. H. Hall, the Visitng Agent, proceeded on leave early in the year and Mr. Sydney Bolster was elected to act for him.

Finance. Receipts from Research Cess Rs. 738,928, Profit from St. Coombs Estate Rs. 83,142 and Interest and Miscellaneous Receipts Rs. 7,631, brought the total receipts for the year to Rs. 829,701 as compared with Rs. 480,947 in 1948. The increase of Rs. 348,754 was mainly due to the increase (Rs. 323,335) in the cess collections which were at the enhanced rate of 25 cents per 100 lb. tea exported from 1st January 1949 and also to an increase in the profit from St. Coombs Estate.

Total expenditure on Revenue Account amounted to Rs. 630,692 as against Rs. 533,226 in 1948 and was made up of Research Revenue Account Rs. 519,808, Interest on Government Loan Rs. 16,897, Depreciation Rs. 43,987 and the Reserve of Rs. 50,000 set aside for the establishment of the Low-Country Sub-Station.

There was therefore a surplus on total working account for the year of Rs. 199,008 as compared with a deficit of Rs. 52,279 in 1948, and a surplus of Rs. 154,101 in 1947. Capital expenditure (net) amounted to Rs. 208,940 as against Rs. 250,538 in 1948 and comprised Rs. 151,313 on assets, of which Rs. 109,355 was on buildings, and Rs. 57,627 being payment of Government loan.

Net liquid assets as at 31st December, 1949, after allowing for liabilities including Furlough and Passages reserve and Accrued Interest on the Government Loan, amounted to Rs. 355,966. The liability of Rs. 704,205 under Depreciation was therefore covered to the extent of 50%. At the end of 1949 there still remained a balance of Rs. 263,995 outstanding against the Government Loan.

St. Coombs Estate. There were no changes in the staff and Mr. F. C. Daniel continued as Superintendent throughout the year.

Unfavourable weather conditions once again proved a serious handicap to the Estate. One of the most severe droughts experienced in the district prevailed at the beginning of the year. Following as it did close on a period of low rainfall in the last quarter of 1948, it was mainly responsible for the low crop harvested during the year.

The yield per acre for the year was 600 lb. as compared with 713 lb. obtained in 1948. The average for the Dimbula district was 592 lb. per acre. The total crop harvested was 174,653 lb. against 207,644 lb. in 1948. Of the total crop 7,928 lb. were used for local consumption and the balance 166,725 lb. sold in the Colombo market at a net price of 220.79 cents per lb. as compared with 165.71 cents per lb. in 1948.

The shortfall in crop was therefore offset by the higher selling price realised and the result was a profit of Rs. 83,142 (Rs. 286 per acre) on the year's working against Rs. 54,494 (Rs. 187 per acre) in 1948. This was achieved in spite of the cost of production working out at 171.73 cents per lb. as against 135.75 cents per lb. in 1948.

In common with most estates in the district, blister blight attacks were comparatively heavy. However, the precautions taken especially as regards pruning helped in some degree to check the severity of the attacks. The estate in general was maintained in good condition under the adverse conditions mentioned above.

Publications. Although the same difficulties which caused the suspension of the publications of the *Tea Quarterly* in 1948 were in evidence during the year under review it was found possible to issue the following:--

Tea Quarterly, Vol. XX, Part 1.
Tea Quarterly, Vol. XX, Part 2.
Bulletin No. 29.

It was hoped to complete Vol. XX of the *Tea Quarterly* with the issue of Parts 3 and 4 early in 1950.

Besides the above there was issued a special publication entitled 'Monographs on Tea Production in Ceylon," No. 1 by Dr. T. Eden dealing with the work of the Agricultural Chemistry Department 1927-1948. This publication was issued free of charge to Superintendents and all those who receive free copies of our publications.

Monograph No. 2 entitled "The Commoner Diseases of Tea" by Dr. C. H. Gadd was in the course of preparation and is expected to be out early in 1950.

The receipts from subscriptions and sales of publications was Rs. 8,644/79 and advertisements Rs. 2,180/50 making a total of Rs. 9,571/25. The expenditure incurred on publications was Rs. 16,299/06. Requests for back numbers of the *Tea Quarterly* continued to be received and many parts of this publication are now out of print. A limited number of some parts are however still available. Particulars can be had on application to the Librarian.

Acknowledgments. The thanks of the Board are due to the Ceylon Association in London, the Planters' Association of Ceylon, the Agency Section of the Planters' Association and other bodies concerned with the Tea Industry for the continued assistance and ready co-operation extended by them to the Institute.

The Board has also to thank the Planters' Association of Ceylon for having placed at our disposal the use of their rooms for meetings of the Board and its various sub-committees.

The Audited Statement of Accounts and the Balance Sheet for 1949 are attached, together with the report on St. Coombs Estate and those of the Director and the Scientific Staff dealing with the research activities of the Institute.

J. LAMB,
Acting Secretary.

BALANCE SHEET AS AT 31st DECEMBER, 1949

1948 Rs.	LIABILITIES	Rs. Cts.	Rs. Cts.
	CREDITORS:—		
4,422	Accrued Interest on Loan	3,629·92	
53,019	Sundry Creditors—Estate	50,435·17	
21,796	Sundry Creditors—Research	23,331·32	
3,809	Subscriptions for Publications received in advance	54·20	
301	Contributions for Cart Road received in advance	301·00	77,751·61
	LOW COUNTRY SUB-STATION		50,000·00
	FURLOUGH PASSAGES PROVISION:—		
	As at 31st December, 1948	20,863·19	
	Additions during 1949	21,844·33	
		42,707·52	
20,863	*Less:* Payments in 1949	15,995·35	26,712·17
	DEPRECIATION PROVISION:—		
	At 31st December, 1948	666,554·41	
	Added 1949	43,987·53	
		710,541·94	
666,554	*Less:* Items scrapped in 1949	6,336·87	704,205·07
c/o 770,764			Carried over Rs. 858,668·85

1948 Rs.	ASSETS	Rs. Cts.	Rs. Cts.
	DEBTORS:—		
	Principal Collector of Customs Fixed Deposit due in 1949 received in 1950	61,506·29	
		12,121·95	
	Interest on above	99·96	
	Advertisement Receipts	1,704·50	
66,941	Balance due on upkeep of Waltrim Cart Road for 1949 received in 1950 from George Steuart & Co.	150·00	75,582·70
	DEBTORS RESEARCH:—		
	Ceylon Association in London £91·16·10	1,224·56	
	Research Staff	2,948·90	
	Sundries	297·32	
	Accrued interest on investments	1,600·75	
	Blister Blight Expenditure to date	21,735·82	
23,090	Sundries—Estate	4,371·43	32,178·78
	STOCKS IN HAND:—		
	Stamps 6·21, Timber 545·05, Petrol 67·09, Rice 2,147·76, Packing materials 19,688·08, Electrical Goods 600·18	23,054·37	
68,389	Tea 25,023 lbs. at prices, since realised	71,322·95	94,377·32
c/o 158,420			Carried over Rs. 202,138·80

THE TEA RESEARCH INSTITUTE OF CEYLON

BALANCE SHEET AS AT 31st DECEMBER, 1949—*contd.*

1948 Rs.	LIABILITIES	Rs. cts.	Rs. cts.	1948 Rs.	ASSETS	Rs. cts.	Rs. cts.
B/f 770,764	Brought forward		858,668·85	B/f 158,420	Brought forward		202,138·80
	NOTE:—				INVESTMENTS AT COST:—		
	Loan from Ceylon Government	263,994·94			Rs. 20.000/- 3½% Ceylon Government National Loan 1956	20,000·00	
	Revenue from Cess on Estates and other sources applied to Capital	1,994,625·50			Rs. 30,000/- 3½% Ceylon Government Loan 1957/62	29,512·50	
	General Funds Spent on Capital Expenditure	348,238·71			Rs. 15,000/- 3% Defence Bonds 1952	15,000·00	
	Value of Fixed Assets, at Cost at 31st December, 1949	Rs. 2,606,859·15			£. 2,300/- 3½% War Loan	32,434·76	
					£. 6,750/- 2½% National War Bonds 1952/54	90,000·00	
				236,875	£. 2,063·18·1 4% Funding Loan 1960/90	29,928·06	216,875·32
					(Approximate Market value Rs. 214,162/-)		
					CASH:—		
					On Current Account	73,721·81	
					Petty Cash	727·48	
					Imprest Account	22·81	
					Estate—N. B. I., Ltd., Colombo 16,814·42		
				37,172	Estate—In Hand 129·50	16,943·92	91,416·02
					FUNDS OVERSPENT:—		
					To 31st December, 1948	338,297·48	
					Capital Expenditure 1949	151,323·28	
					Government of Ceylon Loan Repayment	57,626·61	
						547,247·37	
				338,297	*Less:* Revenue Account, Surplus 1949	199,008·66	348,238·71
Rs. 770,764			Rs. 858,668·85	Rs. 770,764			Rs. 858,668·85

We have examined the above Balance Sheet with the books of the Tea Research Institute of Ceylon and St. Coombs Estate and have obtained all the information and explanations we have required. The allocations of capital expenditure and of research revenue expenditure as made by the director have been accepted by us. In our opinion, the foregoing balance sheet is properly drawn up so as to exhibit a true and correct view of the financial affairs of the Institute as at 31st December, 1949, according to the best of our information and the explanations given to us and as shown by the books.

(Signed) FORD, RHODES, THORNTON & Co.,
Chartered Accountants.

Colombo, 31st May, 1950.

ESTATE WORKING ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1949

1948 Rs.	EXPENDITURE	Rs. cts.	Rs. cts.	1948 Rs.	INCOME			Rs. cts.
	To Estate Expenditure—Revenue:—				By Tea Sales:—			
80,988	General Charges	82,797·97			Colombo to Invoice No. 57			
49,374	Upkeep	58,603·80				166,725 lbs.	383,895·41	
20,086	Cultivation	33,086·26			Local	950 ,,	1,488·82	
62,699	Harvesting	56,899·59			Broken Mixed	5,495 ,,	2,445·60	
68,740	Manufacture	68,533·35	299,920·97		Bio Department	211 ,,	476·86	
5,404	,, Colombo Brokerage and Handling Charges		5,493·56	342,054	Gratis	1,272 ,,	—	
269	,, Motor Road Roller Account		—			174,653 lbs.		388,306·69
54,494	,, Balance Carried Down		83,142·06	—	,, Motor Road Roller Account			249·90
Rs. 342,054			Rs. 388,556·59	Rs. 342,054				Rs. 388,556·59

REVENUE ACCOUNT AS AT 31st DECEMBER, 1949

1948 Rs.		Rs. cts.	Rs. cts.	1948 Rs.		Rs. cts.	Rs. cts.
	To Administration of the Board:—			54,494	By Balance from Estate Working Account		83,142·06
240	Planters' Association of Ceylon	240·00			,, Tea Cess Previously	677,421·41	
3,215	Travelling of the Board	3,905·80		415,594	,, ,, ,, December	61,506·29	738,927·70
12,245	Clerical Staff	15,626·45		417	,, Guest House Account		293·50
1,488	Telephone Operators	1,596·15		—	,, Rent of Caddy		705·00
1,060	Office Peon	1,331·48			,, Interest on Investments and Deposits		
598	Postages	1,219·00		8,372	less Overdraft		6,633·18
1,991	Stationery	2,533·22		8	,, Miscellaneous Receipts		—
—	Advertising	282·50		2,062	,, Gain on Realisation of Investments		—
523	Telegrams, Trunk Calls	979·97		52,279	, Balance being excess of Expenditure over Income		—
303	Printing	—					
—	Legal Expenses	—					
1,797	Auditors' Fees	1,575·70					
209	Contingencies	221·70					
6,363	Dearness Allowance	7,232·97	36,744·94				
c/o 30,032		Carried over Rs.	36,744·94	c/o 533,226		Carried over	Rs. 829,701·44

REVENUE ACCOUNT AS AT 31st DECEMBER, 1949—(*contd.*)

1948 Rs.		Rs. cts.	Rs. cts.	1948 Rs.		Rs. cts.
B/f 30,032	Brought forward		36,744·94	B/f 533,226	Brought forward	Rs. 829,701·44
	To PERSONAL EMOLUMENTS OF SCIENTIFIC STAFF:—					
28,500	Director	29,876·66				
25,950	Pathologist	6,658·06				
—	Successor	8,002·76				
25,324	Agricultural Chemist	2,011·49				
—	Successor	—				
20,330	Bio-Chemist	20,931·00				
12,347	Plant Physiologist	17,404·82				
9,318	Mycologist	8,000·00				
—	Agricultural Officer	2,000·00				
18,142	Leave Pay and Allowances, Retiring Staff	51,534·43				
20,844	Dearness Allowance	25,386·79				
4,157	Proportion 30% Superintendent's Pay	4,330·50	176,136·51			
	,, EMOLUMENTS—JUNIOR AND SUB-SCIENTIFIC STAFF:—					
60,837	Junior Scientific Staff	59,856·49				
8,779	Laboratory Attendants and Fieldman	8,763·65				
23,511	Dearness Allowance	21,931·86	90,552·00			
	,, LABORATORY:—					
6,962	Equipment and General Working Expenses	10,158·53				
4,500	Special Provision for Joint Chemistry of Research on Tea	983·33				
261	Furniture and Office Equipment	104·52	11,246·38			
c/o 299,794		Carried over Rs.	314,679·83	c/o 533,226		Carried over Rs. 829,701·44

REVENUE ACCOUNT AS AT 31st DECEMBER, 1949—(*contd.*)

1948 Rs.		Rs. cts.	Rs. cts.	1948 Rs.		Rs. cts.
B/f 299,794	Brought forward		314,679·83	B/f 533,226	Brought forward	Rs. 829,701·44
	To SMALL HOLDINGS:—					
21,132	Salaries and House Allowances	16,773·83				
11,186	Travelling and General Expenditure	7,837·56				
547	Working Expenses	1,144·15				
2,926	Dearness Allowances	2,171·20	27,926·74			
	,, LIBRARY AND PUBLICATIONS:—					
3,162	Library	4,097·48				
773	Publications	6,727·81	10,825·29			
	,, FIELD AND FACTORY EXPERIMENTS:—					
7,506	Agricultural Chemist	4,496·86				
3,359	Plant Physiologist	7,120·15				
323	Miscellaneous Field Experiments	1,323·31				
5,553	Factory Experiments	5,998·23	18,938·55			
	,, TRAVELLING OF STAFF:—					
5,735	Officers Expenses	10,718·36				
174	Insurance of Car and Licence	671·01				
1,032	Driver's Wages	1,351·35				
512	Driver's Batta	582·55				
4,942	Running Expenses and Repairs	5,876·03				
893	Dearness Allowance	1,138·85	20,338·15			
	,, MAINTENANCE OF BUILDINGS:—					
451	Laboratory	1,101·95				
2,217	Six Senior Staff Bungalows	2,561·22				
2,186	Junior Staff Bungalows	1,260·93				
466	Clerks Bungalows	801·64				
1,570	Miscellaneous—Lines and Buildings	658·47				
235	Passara Buildings	343·20				
18	Guest House	736·77				
	Replacements and Renewals—					
3,430	Senior & Junior Staff Bungalows	—	7,464·18			
c/o 380,122	Carried over	Rs.	400,172·74	c/o 533,226	Carried over	Rs. 829,701·44

REVENUE ACCOUNT AS AT 31st DECEMBER, 1949—(*contd.*)

1948 Rs.		Rs. cts.	Rs. cts.	1948 Rs.		Rs. cts.
B/f 380,122	Brought forward		400,172·74	B/f 533,226	Brought forward	Rs. 829,701·44
	To General Services:—					
11,305	Electric Power	13,358·19				
1,500	Mechanic	1,560·00				
679	Telephones, Rent and Maintenance of Lines	708·00				
750	Roads	750·00				
1,103	Sanitation	1,534·48				
2,908	Water Supply	2,105·10				
294	Tappal Lorry and Book Fees	232·00				
60	Nettikans and Drains	—				
1,878	Upkeep of Grounds	3,033·24				
674	Guest House	935·85				
602	Proportion of Storeman's Salary 33-1/3rd%	720·00				
7,296	Dearness Allowance	8,257·13	33,193·99			
	,, Miscellaneous:—					
357	Dearness Allowance	1.171·65				
303	Incidentals	332·28				
25,533	Provident Fund, Senior Scientific Staff	13,953·17				
11,305	Provident Fund, Junior Scientific Staff	12,035·67				
3,834	Provident Fund, Subordinate Staff	4,438·15				
13,000	Passages Provision	10,000·00				
215	Ceylon Nursing Association and Fraser Nursing Home	135·00				
608	Medical Fees, Subordinate Staff	997·37				
1,338	Medical Scheme Junior Staff	1,272·00				
6,282	Insurances	5,785·98				
1,153	Watchmen and Caretakers	1,892·89				
c/o 473,099		Carried over	Rs. 433,366·73	c/o 533,226		Carried over Rs. 829,701·44

Dr. **REVENUE ACCOUNT AS AT 31st DECEMBER, 1949**—(*contd.*) **Cr.**

1948 Rs.		Rs. cts.	Rs. cts.	1948 Rs.		Rs. cts.
B/f 473,099	Brought forward		433,366·73	B/f 533,226	Brought forward	829,701·44
	To MISCELLANEOUS (Contd.)					
—	Conferences Expenses	1,007·41				
600	Observatory Allowance	600·00				
—	Adjustment to make up to 15% Provident Fund	22,580·61				
2,300	Provident Fund—Retiring Staff	6,101·22				
1,820	Proportion of Superintendent's Furlough and Passage	1,040·00				
200	Junior Staff Association	200·00	83,543·40			
19,944	,, GOVERNMENT OF CEYLON LOAN INTEREST		16,896·67			
35,263	,, DEPRECIATION		43,987·53			
—	,, LOW COUNTRY PROPOSED SUB-STATION		50,000·00			
—	,, FIELD DEMONSTRATION ACCOUNT		2,898·45			
	,, Balance being excess of Income over Expenditure for the year ended 31st December, 1949		199,008·66			
Rs. 533,226			Rs. 829,701·44	Rs. 533,226		Rs. 829,701·44

THE TEA RESEARCH INSTITUTE OF CEYLON

Dr. **CAPITAL ACCOUNT AS AT 31st DECEMBER, 1949** **Cr.**

EXPENDITURE

	At 31st December, 1948.	Additions in 1949	Items Scrapped	Total
	Rs. Cts.	Rs. Cts.	Rs. Cts.	Rs. Cts.
To Land—Including Development	931,419·83	13,164·70	—	944,584·53
,, Buildings & Lines	1,163,982·46	109,355·59	1,280·00	1,272,058·05
,, Furniture & Equipment	93,678·68	9,027·81	10·76	102,695·73
,, Laboratory Equipment	45,494·72	5,436·42	331·87	50,599·27
,, Experimental Machinery	33,294·01	1,553·02	—	34,847·03
,, Motor Road Roller	7,386·03	—	—	7,386·03
,, Motor Car	8,525·00	8,850·00	8,525·00	8,850·00
,, Machinery, Estate	163,905·90	—	—	163,905·90
,, Motor Lorry	7,860·00	—	—	7,860·00
,, Winch	—	517·23	—	517·23
,, Hoist	—	2,055·38	—	2,055·38
,, Station Wagon	—	11,500·00	—	11,500·00
	Rs. 2,455, 546·63	161,460·15	10,147·63	2,606,859·15

RECEIPTS

	Rs. Cts.	Rs. Cts.
By Government of Ceylon Loan on Mortgage at 5½% per annum ...	1,000,000·00	
Less: Repayments to 1949	736,005·06	263 994 94
,, Revenue Applied to Capital Purposes to 31st December, 1948	1,795,627·60	
Add: 1949 Underspent	199,008·66	
	1,994,636·26	
Less: Equipment & Furniture—Guest House—Scrapped	10·76	1,994,625·50
,, Funds Overspent To 31st December, 1948	338,297·48	
Add: 1949 (Overspent)	9,941·23	348,238·71
		Rs. 2,606,859·15

THE TEA RESEARCH INSTITUTE OF CEYLON

LOAN ACCOUNT

31st DECEMBER, 1949

	Rs. cts.			Rs. cts.
To Government of Ceylon	1,000,000·00	By Repayments Principal to 31-12-49	...	736,005·06
		,, Balance	..	263,994·94
	Rs. 1,000,000·00			Rs. 1,000,000·00

REPORT ON ST. COOMBS ESTATE FOR THE YEAR 1949

Staff. There were not any staff changes during 1949.

Acreage.

	A.	R.	P.	
Tea in bearing	291	0	28	(including 18 acres experimental plots)
Land available for cultivation	20	0	00	
Buildings & gardens	43	3	11	
Waste land & ravines	32	0	24	
Fuel clearings	36	3	14	
Total ...	423	3	37	

The "tea in bearing" figure is not quite accurate as during the second half of the year 4½ acres of tea were rooted out in No. 10 field.

Weather. (Estate gauge).

	Rainfall inches	Wet days	Sunshine Hours
Registered in 1949 ...	86.66	231	1,839.25
„ „ 1948 ...	89.02	246	1,944.62

Weather conditions during the year were most unsuitable for crop and the health of bushes. The registered rainfall was below average and was badly distributed. During the first few months of the year one of the worst known droughts in the district was experienced. In the last three months of 1948 the rainfall was below average and badly distributed and this continued on in to the drought.

Crop.

	1949 lbs.	1948 lbs.
Estimate	250,000	250,000
Total crop (including Broken Mixed)	174,653	207,644
Yield per acre on 291 acres ...	600	713

Yield per acre. This very low figure of 600 lbs. an acre is definitely accounted for by the climatic conditions reported above, and is some 125 lbs. per acre below the average from the estate over the last ten years. The following acreages were rested and not in bearing for some months and a small amount of the shortage comes from this.

No. 14A — 11 acres, rested for whole of 1949
„ 14B — 2¼ acres, rested for 9 months of 1949
„ 10 — 14¼ acres rested for 10 months of 1949

Some fields pruned into the dry weather are to be rested. The resting period must be extended until the main blister blight epidemic has passed, before "cutting across."

Prices and Total Crop Sold.

Year	Total Crop lbs.	Gross price cts.	Net price cts.
1949 ...	173,381	223.96	220.79
1948 ...	206,419	165.71	163.09

Teas were consistently well reported on during the year.

Cost of Production.

	1949 per lb. cts.	1948 per lb. cts.
Estimate	133.30	116.15
Actual	171.73	135.75

Dearness allowance included in the above was —

	1949 cts. per lb.	1948 cts. per lb.
Senior and subordinate staff ...	6.61	5.37
Factory staff	1.86	1.78
Factory labour	3.20	2.83
Other labour	43.21	33.56
	54.88	43.54

Profit on Estate Working.

1949	Rs. 83,142/-
1948	Rs. 54,494/-

We were fortunate that with such a shortfall in crop, the tea market enabled us to show a profit well above the average.

Capital Expenditure.

1949	Rs. 93,969/-=53.80 cts. per lb.
1948	Rs. 89,206/-=42.96 ,, ,, ,,

The main items under this heading were —

1. Building 12 additional cottage type quarters for labourers.
2. Re-roofing 10 line rooms.
3. Construction of a maternity home, dispenser's bungalow and clerk's bungalow.
4. Partial reconstruction of two line rooms for a midwife's quarters.
5. Construction of quarters for the K.P.

Artificial Manure and Application. The previous policy of applying manure at 6, 16 and 26 months after pruning, at the rate of 35, 45 and 55 lbs. nitrogen per acre was continued until the later part of the year when the programme was revised and application at 4, 12, 20 and 28 months at 35, 55, 65 and 40 lbs. was commenced. At that time it was decided that there should be an increase in the potash application to 36 lbs. and that contour planted fields with a larger number of bushes would receive manure in proportion to the yield.

Soil Improvement. The contour planted fields, which it was decided should be rested after pruning, were well thatched with manna grass as soon as they had been plain forked all over.

Green Manures. *Gliricidia sepium* growth was very slow indeed although a number are established in the top fields. *Albizzia moluccana* plants were put out in the contour clearings, but some were damaged by the cables attached to mechanical plucking machines. Some *Crotalaria grahamiana* seed was put out in the contour clearings which were rested after pruning, and grew very well giving a useful amount of loppings. As the growth tends to be more lateral than that of *Tephrosia vogelii* it appeared that a much earlier removal is necessary.

Pruning. The date of pruning was arranged so that recovery should take place in the dry weather. Pruning was of a much lighter type than that carried out in the past and encourages the spreading habit of bushes.

Plucking. The standard of plucking was improved and a large number of weak bushes being rested are in evidence all over the estate. Mechanical plucking experiments with the electrically operated Tarpen Plucker were commenced in November. The 2¼ acre contour clearing was cut across in July for the purposes of this experiment.

Pests and Diseases. Blister blight attacks were heavy due to climatic conditions in the district, but owing to the pruning being completed before the dry weather, no fields suffered as did No. 5 and No. 8 in the previous year. No. 10 field which recovered so badly after pruning and was consequently rested, was cut across at 18 inches in September. On further investigation it is considered very probable that this field had suffered for years from sun crack after pruning as records show that it had been consistently pruned in to the dry weather.

Replanting of old tea. 4½ acres of No. 10 field was selected for this purpose. Work commenced later in the year than was desirable but this was unavoidable. The old tea was pulled out very efficiently with a mechanical grubber. Contour trenches were cut at a basic figure of five feet apart. Some Guatemala grass roots were supplied, and also some tea plants from seed were put out above roads and drains to become tea hedges.

Labour. This was sufficient.

Lines. Further construction is assisting congestion.

Factory and Machinery. These were maintained in good order.

Re-wiring for lighting and power did not commence owing to some indecision regarding the most suitable type of up-to-date material.

F. C. DANIEL,
Superintendent.

METEOROLOGICAL OBSERVATIONS, 1949.

ST. COOMBS.

(Laboratory Gauges)

MONTH	TEMPERATURES							RAINFALL				SUNSHINE	
	Mean Maximum	Difference from average (15 years)	Mean Minimum	Difference from average (15 years)	Adopted Mean	Mean on grass	Mean Relative Humidity	Inches	Difference from average (15 years)	Days	Difference from average (15 years)	Hours	Difference from average (15 years)
January	74·7	+ 0·5	55·4	+ 0·2	65·0	49·8	70	3·23	- 0·04	7	- 3	213·33	+ 5·74
February	77·0	+ 0·5	52·0	- 2·7	64·5	44·5	58	0·45	- 2·09	4	- 4	235·62	+ 15·28
March	80·9	+ 3·4	53·7	- 1·6	67·3	46·2	58	1·66	- 2·85	4	- 8	261·07	+ 26·13
April	77·1	- 0·5	57·4	- 0·5	67·2	55·2	77	8·04	+ 1·67	18	+ 2	180·42	- 24·96
May	74·8	+ 4·7	58·8	- 1·1	66·8	55·9	77	7·06	- 6·16	22	+ 3	163·93	+ 5·79
June	70·0	- 0·8	60·1	- 0·3	65·0	58·9	86	11·38	- 1·05	23	- 3	78·83	- 20·64
July	71·6	- 1·8	59·2	- 0·3	65·4	58·0	83	11·16	- 1·48	28	+ 2	98·22	- 9·70
August	71·7	+ 0·7	59·1	0	65·4	58·5	86	9·55	+ 0·24	24	- 1	125·85	+ 8·40
September	71·0	- 1·2	59·6	+ 1·3	65.3	58·3	84	8·28	+ 0·15	25	+ 4	95·22	- 44·69
October	72·0	- 1·2	57·6	- 0·3	64·8	56·5	86	10·80	+ 1·00	20	- 2	150·67	- 2·96
November	73·9	+ 0·6	56·9	- 0·7	65·4	54·1	78	8·24	+ 0·02	18	- 3	155·12	- 1·97
December	72·2	- 1·6	57·2	+ 1·2	64·7	53·3	78	7·03	+ 1·87	14	- 1	—	—
	73·9	+ 0·3	57·2	- 0·4	65·6	54·1	77	86·88	- 8·72	207	- 14	1758·28	- 43·58
	Means							Totals					

REPORT OF THE DIRECTOR OF THE TEA RESEARCH INSTITUTE OF CEYLON FOR THE YEAR 1949

Staff. 1949 was remarkable for the staff changes and in particular the retirement of two officers, both of whom have built up reputations which are by no means confined to the Ceylon Tea Industry.

C. H. Gadd, D.Sc., retired in May after 23 years spent in Pathological research at the Institute. Prior to 1926, Dr. Gadd was Mycologist at Peradeniya. He is an authority on diseases of tea and did much original work on fungus diseases and on nematodes. Before retirement, Dr. Gadd wrote a Monograph on the diseases of tea which will be published in 1950.

T. Eden, D.Sc., resigned in January, a few years before his normal retiring age in order to take an opportunity offered for organising a Tea Research Scheme in East Africa. Dr. Eden came to the Institute in 1927 from Rothamsted where he was closely associated with the classical researches of R. A. Fisher. He was thus able to apply the (then) new technique for field experimentation to tea, with greatly beneficial results to the whole industry. Dr. Eden's "Studies in the Yield of Tea" published in the *Journal of Agricultural Science* are a model of accurate field experiments.

Mr. G. B. Portsmouth joined the staff in January. He came direct from East Malling Research Station where he was working on deficiency diseases, as a member of Professor Gregory's team from the Imperial College of Science. Mr. Portsmouth worked on cotton in the Sudan from 1934 to 1937 as Government Plant Physiologist.

Mr. T. E. Walter arrived in Ceylon in October. He has worked in Sarawak and Northern Rhodesia, principally on forestry problems.

Mr. D. R. Kemp resigned in May after a short period of service.

Dr. R. V. Norris, Director of the Institute from 1929 to 1950, left Ceylon for leave in South Africa in November 1949, and as most readers of this report will be aware, died on 28th April, 1950.

The annual report cannot be published until after the accounts of the Institute have been audited and this usually delays the issue of the report on each year's activities until fairly late in the following year.

Dr. Norris's untimely death following the retirement of two such senior experienced officers as Dr. Gadd and Dr. Eden left a gap which has proved extremely difficult to fill.

In my capacity as Acting Director for the period under review, I make my apologies for the very late issue of this report and hope, that as the appointed successor to Dr. Norris, I shall find it possible to restore our publications in the form of annual reports and numbers of the *Tea Quarterly*, to their former regularity of issue.

Such a hope may not be of immediate fulfilment as the extra work involved in blister blight investigations has considerably increased the task of overcoming the difficulties created by the loss of the services of

the three most senior officers of the Institute. I do, however, realise the undesirability of lateness and irregularity in the issue of our publications and express my intention of tackling the problem with vigour.

J. LAMB,
Director.
(Written 23rd May, 1951).

REPORT OF THE ACTING DIRECTOR OF THE TEA RESEARCH INSTITUTE OF CEYLON FOR THE YEAR 1949

The report of the Board and the report on St. Coombs estate contained in the first part of this bulletin do not call for any special comment. The reports of the scientific staff contain a general record of research activities during 1949.

The year was one of exceptional extra-mural activity.

Biennial Conference. The Eighth Biennial Conference was held in Kandy on the 21st and 22nd January at the Hall of Trinity College, Kandy, by the kind permission of the Principal. The attendance was 260, being one of the highest figures recorded. The proceedings have been fully reported in the *Tea Quarterly* for 1949.

Blister Blight Symposium. The preliminary mycological studies of this disease having been completed by Dr. Gadd and Mr. Loos, it was considered advisable to obtain advice on the application of modern crop protection methods from experts.

The Deputy Director flew to the United Kingdom in August and consulted Messrs. Plant Protection Ltd., and Pest Control, Ltd. Returning in September, Mr. Lamb was followed by Dr. Greenslade of Pest Control, Ltd., and Mr. F. W. J. Lane of Messrs. Plant Protection, Ltd.

A symposium on blister blight, held in Nuwara Eliya on the 10th November, 1949, was organised to coincide with the visit of these experts and was attended by scientific officers from all the principal tea producing areas affected by blister blight. A number of agency house representatives, visiting agents and superintendents were also invited to attend.

The following overseas visitors were present :—

Mr. S. Ananda Rau	—	Scientific Officer, United Planters' Association of South India.
Mr. P. de Jong	—	Scientific Officer, United Planters' Association of South India.
Dr. H. Dike	—	Metallo-Chemical Refining Co., Ltd., London.
Dr. R. M. Greenslade	—	Pest Control, Ltd., Cambridge.
Mr. C. J. Harrison	—	Director of the Indian Tea Association's Research Station at Tocklai, Assam.

Mr. F. W. J. Lane	—	Plant Protection, Ltd., London.
Mr. W. Wilson Mayne	—	Scientific Officer, Kanan Devan Estates (Messrs. James Finlay & Co., S. India).
Dr. J. Reitsma	—	Head of the Phytopathological Division of the Institute for Plant Diseases and Pests of the Central Agricultural Research Station, Buitenzorg, Java.
Ir. J. H. van Emden	—	Botanist, West Java Experiment Station, Buitenzorg, Java.

The visits by the crop protection experts and the symposium were not expected to lead to any immediate and spectacular results. Nevertheless, much was gained from both. All available information about blister blight was pooled and many uncertainties were cleared away. For instance, spraying from air craft was removed from the list of possible approaches, and the general pattern of epidemic attacks in different countries was found to be the same. In general, the approaches to the problem of control were greatly clarified. The proceedings of the symposium were published in the *Tea Quarterly*, Vol. 20, parts III-IV, 1949.

Following all these activities, a report was submitted to the Tea Controller on 28th November, 1949, containing details of a programme of research on control measures, as well as estimates for the cost of such work, to enable special funds to be made available. Pending the actual provision of these special funds, the Board of the Tea Research Institute authorised expenditure on a suspense account to enable the work to be started. The report was published in full in *Tea Quarterly*, Vol. 20, parts III-IV, 1949.

Field Demonstrations. A field demonstration was held at St. Coombs on the 29th and 30th November and was attended by 550 persons, which was approximately double the attendance at any previous field day held at the Tea Research Institute.

Organised parties of approximately 45 persons were conducted round the demonstration area by a guide equipped with a portable "loudspeaker" starting at times arranged by invitation. The tour of the demonstration area occupied about two hours.

The various items in this demonstration were as follows:—

(I) Spraying machines, including a demonstration by Mr. F. W. J. Lane of Plant Protection, Ltd.

(II) The layout of an area to be replanted in contours.

(III) Mechanical uprooting for replanting (Trewalwyn Grubber).

(IV) Mechanical plucking (Mr. B. D. Fay).

Displays of mechanical implements and estate tools were also arranged in the factory and in the space around the factory. A continuous cinematograph performance also ran between 10.00 a.m. and 4.00 p.m. at which the following films were shewn.

The Gentle Menace The Hidden Enemy	Kindly loaned by Pest Control Ltd.
The Colorado Beetle Campaign The Wines and Vines of France	Kindly loaned by Plant Protection Ltd.

The traffic arrangements for 150 cars on each day worked very smoothly and many letters expressing appreciation of the demonstration and arrangements were subsequently received. The whole staff enjoyed giving the demonstration and were greatly encouraged by its success.

Acknowledgments. The difficulty of adequate expression of gratitude, which is really genuine, to those who have assisted the Institute in so many different ways is an annual one. The Board of Control and the staff are very sensitive of the support they enjoy from the Associations concerned with the Industry, from Agents and Superintendents, and from Tasters who help so materially in tasting experimental teas. The staff receive much generous hospitality during their advisory visits, and on social occasions, and are happy in the service of the Tea Industry of Ceylon.

J. LAMB,
Acting Director.

REPORT OF THE CHEMICAL DIVISION FOR THE YEAR 1949

Staff and Organisation. Following the departure of Dr. Eden it was decided to amalgamate the Biochemistry and Agricultural Chemistry Departments into a unified division. The work of these departments has much in common and the difficulties of finding an experienced agricultural chemist to replace Dr. Eden were only too apparent.

The field experiments which constituted the major part of the Agricultural Chemistry Department's activities in former years, were transferred to the charge of the Plant Physiologist, thus unifying activities in this branch of work. It was agreed that all chemical analyses should be undertaken by the Chemical Division since it is obviously more efficient for analysis of plant materials to be undertaken in the Chemical Division where chemical analysis is a routine matter rather than in the Plant Physiology Department, which is not equipped either with staff or materials for this purpose. Physiological work nevertheless calls for information about the chemical composition of various parts of the plant under varying conditions. Under this arrangement the staff formerly serving in the Agricultural Chemist's department were occupied with potash determinations.

The Biochemist will administer the whole division and the new Agricultural Chemist, when engaged, will be his deputy. The continuity of direction of work in the division should thus be assured. The identity of the former department will be retained, but the former division of the old Biochemistry Department into Biochemistry and Tea Manufacture or Technology will be more clearly defined.

Correspondence.

Agricultural Chemistry, Biochemistry and Technology } 682 letters were received and 720 despatched.

During the latter part of the year the Biochemist dealt with part of the correspondence on manuring as Deputy Director or Acting Director.

Technology. 51 rolling programmes for 21 factories and 13 drawings of roller fittings for 5 factories were despatched.

Advisory. The Biochemist visited 25 factories and the Technologist 10 factories.

AGRICULTURAL CHEMISTRY DEPARTMENT.

This department was mainly occupied with potash determinations in connection with the work on potash deficiency reported by the Plant Physiologist.

The technique of "foliar diagnosis" involves a very large number of analyses and the interpretation of the results will be made, in due course, by the Plant Physiologist.

All analysis of materials from the field experiments will be carried out by this department and incorporated in the Plant Physiologist's report on field experiments.

Although in the absence of an Agricultural Chemist it was impossible to extend the activities of this section much beyond the large number of potash analyses, some thought was given to future activities. Nitrogen, phosphate and potash are the major nutrients required by tea but there are also a number of other nutrient elements required in amounts varying from quantities comparable to nitrogen, phosphate and potash, to traces of the so-called minor elements.

It has therefore been decided that the new Agricultural Chemist should extend Dr. Eden's studies on nitrogen, phosphate and potash nutrition to a fuller study of nutrition in general.

As a preliminary to this, Mr. Ramaswamy, the Assistant to the Biochemist, was asked to undertake a complete analysis of the ash of tea leaf grown at the three elevations into which tea growing districts are classified.

The results were as follows :—

Table 1. *Analysis of Tea Leaf Grown at Different Elevations.*

Total Ash	Low-Country 5·22%	Mid-Country 5·13% Analysis of Ash Percentage of Ash	Up-Country 4·37%
Potash as (K_2O)	44·22	41·11	44·63
Soda as (Na_2O)	1·15	0·46	0·92
Lime as (CaO)	10·72	13·27	10·80
Magnesia as (MgO)	7·55	7·19	7·25
Iron as (Fe_2O_3)	0·34	0·50	0·51
Aluminium as (Al_2O_3)	2·53	2·44	2·94
Manganese as (Mn_2O_3)	0·49	0·36	0·25
Phosphoric acid as (P_2O_5)	11·86	15·05	18·31
Sulphur as (SO_3)	5·51	4·05	3·82
Silica as (SiO_2)	0·97	0·75	1·56
Chlorides as (Cl)	1·04	1·70	0·84

The copper content of Ceylon tea leaf varies from 25 to 30 parts per million in most areas.

The following analyses were carried out some years ago :—

Table 2. *Fluorine Contents of Tea Grown on Soils derived from various geological formations.*

Geological formation	Fluorine content of B. O. P.	Remarks
Quartzite	29 p.p.m.	Average of 5 samples
Biotite	72 ,,	,, 9 ,,
Galle series	32 ,,	One sample only

These figures are given for purpose of interest and record. It is not possible to interpret their significance.

Tea is a curious plant in that it accumulates exceptionally large amounts of aluminium, manganese, fluorine and copper. Some preliminary assays of minor elements were attempted. Repeated attempts to find the element

boron in tea leaf were unsuccessful. This has served to stimulate interest in this particular element.

BIOCHEMISTRY.

The Effect of Season and Plucking Rounds on the Chemical Composition of Tea Leaf. Systematic analysis of leaf harvested weekly and fortnightly throughout the year were commenced at the beginning of the year. The material was supplied by the Plant Physiology Department.

By the end of the year only seasonal variations were apparent.

A detailed account of the experiment will be published later.

Mr. Ramaswamy reports as follows :—

Tea Enzymes.

1. *Pectase.* In the annual report for 1948 it was mentioned that the enzyme, pectase, present in the tea leaf is responsible for the demethylation of the tea pectin during fermentation. Having established this fact, work was undertaken during the year under report to purify the enzyme and study some of its properties. A method of purification described below gave a very highly active preparation with the minimum solid content.

Green tea leaf was "turmixed" with dry acetone for about 2.3 minutes and filtered immediately through a Buchner; the residue was washed several times with dry acetone until all the coloured constituents of the leaf were removed. It was then dried in vacuo over calcium chloride, and the enzyme extracted with neutral phosphate buffer (M/2 Na2HPO4 adjusted to pH 7.0 with hydrochloric acid using bromothymol blue as indicator). The extract was treated with solid ammonium sulphate to about 30% saturation. The precipitate obtained was centrifuged off and rejected. The second precipitate obtained at about 71% saturation with ammonium sulphate was taken up with distilled water and filtered. Further purification of the filtrate was effected by absorbing the *impurities* on to precipitated tricalcium phosphate. The water clear filtrate showed the highest activity and proved to be the purest so far obtained on dry weight basis. Attempts to further purify the enzyme were unsuccessful.

The activity of the purest preparation was found to be 13,000 times that in the green leaf. Spectrographic analysis (preliminary only) carried out in the United Kingdom* showed traces of copper in this preparation, possibly due to traces of polyphenol oxidase still adhering to the enzyme. Traces of calcium found might be due to the use of tricalcium phosphate during purification. No other metals were identified in significant amounts.

Kinetics of the enzyme. The course of demethylation followed a straight line up to a period of 20 minutes after which it fell considerably. The optimum pH of reaction of the purest preparation lies at 6.8, the optimum temperature being at 45°C.

2 *Polyphenol oxidase.* Further experimental data was obtained which still disagrees with explanations of the mechanism of tea fermentation put forward by workers in North East India. A set of experiments was designed to disintegrate completely the cellular structure of tea leaf with-

* We are greatly indebted to the East Mailing Research Station for their co-operation.

out inhibiting the enzymes present in the leaf. In some experiments enzyme preparations were also added. Only insignificant amounts of carbon dioxide were observed in these experiments, while, according to workers in North East India, carbon dioxide is produced in measurable quantities under similar conditions.

Composition of Tea in Relation to its Manufacture. In recent publications, Dr. Bradfield** has shown that the major factors governing the quality of tea, as judged by the tea taster, are the total amount of polyphenols and the proportion existing as ethyl-acetate-extractable polyphenols. With the limited supply of material, his work was confined to made tea only. A repetition of the work was, therefore, undertaken, not only to confirm his results but also to study the fate of these constituents from green leaf to fired tea. The results obtained show that:—

(1) The quality of tea depends to a large extent on the total water soluble material and the fraction of this soluble in ethyl acetate (minus caffeine). This again depends upon (a) the period of fermentation and (b) the temperature of fermentation. Excessive periods of fermentation cause a reduction in both total water soluble and ethyl acetate extractable materials with a parallel reduction in quality. A similar effect is produced when fermentation takes place at higher temperatures.

(2) There is an increase in the total water soluble as well as the ethyl-acetate extractable matter during withering; this quantity falls gradually after rolling as the period or temperature of the fermentation increases.

TEA TECHNOLOGY.

Mr. Keegel, assisted by Mr. Gunaratnam, reports as follows:—

Clivemeare Manufacture. A few experiments were carried out to test a new Clivemeare roller. Leaf appearance as associated with this type of manufacture was rather poor in comparison with normal rolled teas, but according to Colombo Buyers the teas made from this roller were suitable for all markets. The infusions were excellent and flavour superior to the normal.

P. F. Manufacture. Leaf from Denawaka Estate was specially manufactured, part of which was pressed into blocks for despatch to England where it was to be tried out in the urn trade. A portion of the same bulk which was normally rolled was also sent. One buyer in London considered the liquors of the P.F. teas 'heavy' without milk but preferred them to the normal when tasted *with* milk. In a canteen where the pulped teas were drunk for a week 'blind' no comments or complaints were made.

Multiple Roller. This roller was put to the test and found unsatisfactory. On account of small diameters, the rollers will have to work at a higher speed if pulping is to be satisfactory.

Tests with miniature plywood chests from the plywood factory. Nine chests treated with different insecticides were tested for taint. Another insecticide prepared in the laboratory was also tested for its suitability in relation to taint.

Experimental roller tables. A table which was designed for heavy pressure failed to give the desired results. Numerous modifications were carried out but they did not succeed in inducing removal of leaf which collected in the grooves.

** Chemistry of Tea Investigations in London.

The tea itself made from this table compared very favourably in appearance and liquor with that from conventional tables. As no particular benefit was derived from such a table experiments were abandoned.

Percentage out-turn of made tea to green leaf. Arising from numerous enquiries on out-turn a start was made on the collection of data to determine the effect of age of leaf on out-turn. It is proposed to publish these figures shortly.

Infra Red Radiation. Experiments with infra red lamps failed to give any indication of any possible advantages. Since the same amount of heat is required to evaporate a pound of water, however the heat is applied, the use of electrical energy for drying tea is not economical. Only a very marked gain in quality could justify electrical drying and infra red drying did not achieve any such effect.

E. P. Rolling vs. Batten Rolling. A long term experiment was commenced to determine the relative merits of the two types of rolling in commercial practice.

Alternate batches of E. P. and Batten rolled teas manufactured each day were separately graded and stored. The comparative invoices were then sold on the open market and valuations obtained on the same teas from buyers and brokers in Colombo and London. So far the prices realised at the Colombo auctions and the valuations given show very little difference between the two methods of rolling.

"Fadeaway Cones," Continuous pressure vs. 5 minutes on, 5 off. A few experiments on the Commercial rollers have shown no difference between the two methods of pressure application. Experiments are to be continued in 1950.

Experiments to increase out-turn of fannings grades. In view of the high prices realised for the fannings grade at the Colombo auctions a number of experiments were carried out to find the best method to increase the production of the out-turns of this grade. Detailed results are being published in a separate article for the *Tea Quarterly*.

The conclusion was that any increase resulting from a change in rolling technique was at the expense of some other grade. An alteration in the grading procedure, such as the use of larger mesh, appeared to give the most satisfactory results but for any economic advantage to be gained the more leafy type of fannings produced as a result would have to find more favour than the grainier variety. The question is, therefore, purely one of the particular requirements of the market which, today, fluctuates to such an extent that it is difficult to forecast.

Fermentation temperatures. Indications were obtained of possible improvements in fermentation by carrying out the process in humid atmosphere at temperatures higher than normal. Optimum results were obtained at approximately 80°F. but results were very poor at 100°F. even when the period was restricted to one hour.

Fermentation at higher temperature involves considerable technical complications as the problems of maintaining high humidity is not an easy one to solve in practice. If conditions of high humidity are not maintained, fermenting leaf dries out rapidly and fermentation is checked.

Estates are warned against attempting to ferment at temperatures above normal until further information is published.

J. LAMB,
Biochemist.

REPORT OF THE PLANT PHYSIOLOGIST FOR THE YEAR 1949

Organisation and Staff. Mr. G. B. Portsmouth, the Plant Physiologist, arrived from the U.K. in January and assumed charge of the Department. Shortly afterwards, Dr. T. Eden, the Agricultural Chemist, left for the U.K., having resigned his appointment. As a consequence of these changes, responsibility for the Institute's long term field experiments was transferred to this Department.

Advisory Correspondence. 690 letters were received and 640 despatched.

General. A marked feature of the year under review was the big increase in the volume of general advisory work. Almost twice the number of letters were dealt with than in 1948 and more than 50 estate visits were made by the Plant Physiologist. In addition, a general tour of the Morawak Korale District was made during December in company with the Acting Plant Pathologist.

The Plant Physiologist also represented the Institute at the United Planters' Association of Southern India Conference, held in Coonoor at the end of August, and spent nearly a fortnight visiting estates in the Nilgiris and High Range.

Although a great deal of the Department's time and labour has necessarily had to be diverted to blister blight work, the hard work and enthusiasm of the staff has made it possible to continue with almost all our previously planned lines of research. Some of the more interesting developments during the year are accordingly briefly outlined below.

Potash Deficiency. One of the more important problems facing us is the general deterioration of some areas of Up-country tea. Fields which once carried a complete cover of tea now show more bare soil than bushes, while shortage of starch reserves is becoming commoner at increasingly higher and higher elevations. Although hard plucking, hard pruning and blister blight have all made their contributions towards this deterioration, the commonest general cause would appear to be manurial deficiency, of which a shortage of potash is probably the principal operative factor. This situation was undoubtedly brought about by fertiliser rationing during the war, when supplies of potassic fertilisers were entirely inadequate and in fact totally unobtainable for several years. The effects of this potash shortage were still further aggravated on many estates, by the interplanting of potash hungry food crops such as manioc (*Manihot utilissima*) and sweet potatoes (*Ipomoea batatas*).

Potash deficiency will probably first be noticed as a marked decline in yield resulting from the "shutting up" of the bushes. Looked at more closely, affected areas are found to be characterised by thin looking bushes which exhibit continuing defoliation of comparatively young leaves. Many of the smaller shoots consist of a large number of extremely short internodes from which all leaves have been shed except for one or two stunted specimens at the apex. Growth is naturally very much slowed down and, in effect, it seems that each new leaf is only produced at the expense of an older leaf being shed. Before being shed the leaves normally go through the usual range of senescent colourings, even though they may

be actually only a few months old, and in extreme cases show marked symptoms of marginal scorching.

The replacement value of potash stands at about 4 lbs. for each 100 lbs. of made tea produced, so, as was only to be expected, it is often the best yielding fields which show the most marked symptoms of potash deficiency. Examination of the manurial figures for a number of more badly affected fields over the past ten years has afforded striking confirmation of the correctness of our diagnosis, since potash deficits of 200 lbs. and over per acre have proved to be widespread.

The extreme seriousness of severe potash deficiency is well illustrated by the condition of a field recently examined in which there was a potash deficit of just over 200 lbs. per acre over the last ten years calculated on the basis of yield and fertiliser applications. Although only one year from pruning, the bushes in this field had already lost almost all their older leaves. Those mature leaves still remaining on the bushes showed, in nearly all cases, marked symptoms of marginal scorch, while top growth had obviously been much restricted as was shown by the very small leaves that had been produced. As might be expected cropping was practically nil.

Fortunately, the condition is one that is easily remedied, since, provided the bushes have not already deteriorated so far that recovery is impossible, an immediate and adequate application of potash is all that is necessary to start the bushes on the road to recovery. Furthermore, provided adequate potassic manuring is maintained in the future there is no reason to anticipate any recurrence of this deficiency condition. However, although the cause of the condition may be removed in this way, a considerable period of resting may be required before a satisfactory cover of foliage is regained and the lost vigour of the bushes restored

Tea Selection and Vegetative Propagation. This work is still continuing at a high priority and during the year much progress has been made on estates with selection and propagation of high yielding blister resistant clones. During the year 12 new clones were selected on St. Coombs. Cuttings from these together with cuttings of 17 clones from other estates were propagated for preliminary trials. Two new clones were planted out in the multiplication plot.

1947 Clonal area. The growth of most of the clones planted in 1947 is quite satisfactory in spite of the set back due to the severe drought early in the year. These clones were given a light cut across in December and will be brought into plucking during 1950.

In order to obtain some idea of the amount of propagation material that can be made available after only three years, counts were taken of the number of cuttings produced by a representative clone (No. 2024). These figures showed that it was possible to get between 150 to 200 cuttings per bush. The original propagation of this clone was carried out in November 1946 so even if only 50 plants are put out into the multiplication plot it is quite possible to obtain a crop of 10,000 new cuttings within three years. Once production has started the supply continues to increase. Accordingly, if only two crops are taken each year, it is easy to see that enough cuttings for an extensive supplying or replanting programme can soon be obtained, even from a comparatively small number of original selections, provided that they are properly multiplied up.

Of the 23 clones, selected from No. 8 field in October 1947, 5 were discarded owing to poor rooting in the nursery and as many as 12 were rejected in the field due to poor growth. Of those remaining none appear to be vigorous growers. These bushes were selected solely for resistance to blister blight irrespective of other characters. It is thus evident that in selection it is most important that a combination of characters should be the deciding factor. That vigour of growth and yield potentiality must not be neglected in selection for blister blight resistance, is again brought out by the fact that the better St. Coombs clones, selected prior to the advent of blister blight, are still maintaining their high yields in spite of a considerable amount of blister attack.

1937-1943 Clonal Series. Field records of all clones in plucking are being maintained. 23 clones that were in plucking were discarded owing to susceptibility to blister blight and other undesirable characters. The yields during the year have not been high, mainly due to the unfavourable weather conditions experienced at the beginning of the year. Another cause is almost certainly the low level (i.e., 40 lbs. nitrogen per acre per annum) at which manure has been applied in the past. Provision has now been made to increase application rates in conformity with yield levels.

Rooting habits. It is interesting to note that only one clone (No. 1000) was badly affected by the severe drought. There was almost complete defoliation in bushes of this clone.

A few bushes of No. 1000 were uprooted carefully in April with a view to determine their general habit of rooting. It was observed that all plants that were uprooted showed a marked similarity in their root formation. They all had mainly horizontal roots extending no further than a depth of 12 to 15 inches.

A few other bushes of two other clones growing under similar conditions, but unaffected by drought were also uprooted. These had their main roots descending to a depth of 2½ to 3 feet.

These examinations clearly revealed that the rooting habit of an internode cutting is just as specific a clonal characteristic as yield, type of leaf, resistance to blister blight, etc. For convenience the various clones can be divided, according to their rooting habits, into the following 3 general classes :—

(1) *Vertical Rooters.*
Main roots descending vertically. This includes clones with a single tap root.

(2) *Horizontal Rooters.*
Most main roots horizontal.

(3) *Intermediate Rooters.*
Most main roots penetrating the soil at an angle of about 45°.

By far the largest proportion of our clones would be placed in class (3). Clonal plants both in this class and class (1) should be capable of standing up to drought quite as well as plants grown from seed, but clones in class (2) are definitely not drought resistant and should be discarded. Up to the present, however, only clone No. 1000 of all our many clones has been found to show this undesirable rooting habit.

Plants grown from seed do not exclusively develop vertical root systems, either, as the following table (Table 1) obtained by examing the root system of a sample of 500 bushes, approximately 20 years old, uprooted from No. 10 field on St. Coombs, indicates :—

Table 1. *Root Systems of bushes grown from seed.*

Type of Root System.	No. of Bushes.	Percentage.
Horizontal	91	18·2
Intermediate	93	18·6
Vertical	111	22·2
Both vertical & horizontal	205	41·0
	500	100

Examination of the area gave no indication of any physical cause for the 18% of horizontal rooters and it must accordingly be assumed that such bushes possess a genetic character for horizontal root growth. A proportion of horizontal rooters is probably to be expected, in any batch of seedlings. Such plants may well account for a large number of the early casualties which normally occur in new planting. Furthermore, the percentage of horizontal rooters obtained from any batch of seed is likely to much exceed the observed figure of 18% given above for mature tea, since it is only to be expected that a large number of horizontal rooters will fail to establish themselves and have to be resupplied.

Green Manures. Work with various *Crotalaria spp.* is continuing. Of these *Crotalaria grahamiana* has now been grown fairly extensively in the field and shows promise of being a very satisfactory green manure for these elevations. Trouble is, however, experienced in obtaining seed due to attacks by caterpillars of the genus *Argina* on the flowers and pods. Spraying with nicotine during flowering, followed by Gammexane as soon as the seed has set has been found to afford satisfactory protection. Unfortunately, it has not been found possible to obtain any seed from our *Crotalaria agathifolia* trees although they flower quite freely. Supplies of fresh seed from India are still not forthcoming. Other *Crotalarias* under trial include *C. brownei, C. Semperflorens* and *C. lanata.*

Field Experiments. Three of our main long term experiments completed cycles during the year. Some of the more interesting results obtained are briefly indicated below.

(1) *The three factor (N.P.K.) manurial experiment.* Here the centre of interest lies in the striking increase in the size of the response to potash manuring. Although well in evidence during the previous (5th) cycle, the responses given by the different potash treatments have now risen very much higher and are on a comparable level to those produced

by nitrogen as can be seen, from a study of Table 2 below :—

Table 2. *N.P.K. Experiment 6th Cycle.*

Nitrogen			Potash		
Treatment level	Cycle/Yield lbs/acre	Increase	Treatment level	Cycle/Yield lbs/acre	Increase
N 40	2012	—	K 0	1996	—
N 60	2220	208	K 20	2302	306
N 80	2462	242	K 40	2397	96
		450			401

Although there is little difference in the responses at the highest manurial levels it may be remarked that, at the lower levels, the response in terms of yield to 20 lbs. potash is now much greater than that produced by 20 lbs. of nitrogen.

The fact that potash manuring has now become of primary importance in this experiment was further confirmed by the visible symptoms of potash deficiency, including marked marginal scorching, which were noted in the K0 plots prior to pruning.

Like all previous cycles, there was again no response to phosphate manuring above the P.30 level.

(2) *The fish leaf plucking experiment.* Certain of the previous (2nd) cycle treatments were reversed during the current (3rd) cycle, thus rendering it possible to make some assessment of the long term damage caused by fish leaf plucking.

The extent of the short term increase in yield obtained by fish leaf plucking over one cycle is shown below (Table 3) :—

Table 3. *Short Term increase in yield due to fish leaf plucking.*

Treatment		Total Yield	
Previous cycle	This cycle	lbs/acre	Difference
Single	Fish	2911 (plus)	+ 476
Single	Single	2435	—

This extra yield is, however, only obtained at the expense of a marked deterioration of the bush as the following figures illustrate (Table 4):—

Table 4. *Long term decrease in yield due to fish leaf plucking.*

Treatment		Total Yield	
Previous cycle	This cycle	lbs/acre	Difference
Fish	Single	1854 (Minus)	— 581
Single	Single	2435	—
Fish	Fish	2006 (Minus)	— 429
Single	Single	2435	—

Thus fish leaf plucking in the previous cycle has produced a decline in yield in the present cycle of some 581 lbs./acre when the plots are plucked normally, which loss is only reduced to 429 lbs./acre if continued stripping is resorted to.

The bushes on the plots subjected to two cycles of fish leaf plucking carried almost no pruning wood and further serious deterioration as well as a number of deaths may be confidently anticipated during the course of the next cycle, if stripping is continued.

(3) *The Passara manurial experiment.* At the conclusion of the 6th cycle the main response on this experiment still continues to be produced by nitrogen, although there are indications that a direct response to potash may be developing. The effect of phosphate manuring is still, however, anomalous, since either alone or in interaction with potash it tends to exert a depressant action on yields. A possible explanation of this result may be weed competition since it was shown in the Annual Report of the Agricultural Chemist for 1948 that phosphate manuring gave rise to considerable weed growth. This weed response to phosphate was increased more than fivefold in the presence of potash.

(4) *Other experiments.* A small scale experiment was carried out at Passara during the year in which the effect of lime washing on budbreak after pruning was examined. Bud counts indicated that there was rather earlier budbreak from the old wood following lime washing. No extra buds were, however, produced and the earliness affect soon disappeared.

G. B. PORTSMOUTH,
Plant Physiologist.

REPORT OF THE ACTING PATHOLOGIST FOR THE YEAR 1949

Staff. The Pathologist, Dr. C. H. Gadd, proceeded on leave prior to retirement on May 3rd, 1949. He had been in charge of the Mycological Section since the inception of the Institute in July 1925, and was appointed Pathologist in January, 1949, when the Mycological and Entomological sections were amalgamated.

The loss of Dr. Gadd's services is a severe one, as his knowledge of pathological problems is extensive and his ability as a research worker widely known. His service with the Institute will always be remembered for his many notable contributions to our knowledge of the pests and diseases of tea.

The Mycologist, Mr. D. R. Kemp, resigned his post on May 3rd, 1949.

The Pathology division, following the departure of these two officers, consists of :—

The Acting Pathologist.

One Assistant Pathologist (Passara Sub-Station).

Two Technical Assistants.

One Field Assistant (Passara Sub-Station).

Three Laboratory Attendants (One at Passara).

There were no additions to the staff during the year. Mr. Fonseka was transferred to St. Coombs from October 9th to December 1st.

Advisory. Advisory work increased considerably during the year. 910 letters were received and 834 despatched as compared with 576 and 497 respectively in 1948. 407 consignments of diseased specimens were received, but no pest or disease other than blister blight was unduly prominent.

Publications. The following paper was prepared for publication in technical journals :—

Ranaweera, D. J. W. Observations on the Life History of *Bethylus distigma,* Motschulsky (*Goniozus montanus* Kieff). *Zoological Society of India,* Vol. 2, No. 2. (In press).

Blister Blight. As in the previous year the main activity of the department was directed to blister blight research. With the completion of work on the life history and morphology of the casuative fungus *Exobasidium vexans* it was possible for this department to start small scale experiments on its control with fungicides.

Following on the long period of dry weather in the early part of the year, the disease was at a very low level when the South West monsoon set in during May. The build up of blister infections was, therefore, considerably delayed, and it was not until 8 weeks after the break of the monsoon that infections were sufficiently widespread to cause anxiety.

In Up-Country areas subject to the South West monsoon, very severe attacks were reported in July and September, while in areas subject to the North East rains attacks developed in December. At medium eleva-

tions fairly severe attacks, especially in areas under somewhat dense shade, were reported in December following the cold, wet weather which approximated to upcountry conditions.

Copper fungicides. A number of copper-based fungicides distributed under different proprietary names, are now available in Ceylon. Most of them contain 50 per cent metallic copper in the form of cuprous oxide or copper oxychloride. Though a few manufacturers claim distinctive merits for their copper preparations, experimental results show that no marked differences exist and that preparations by reliable manufacturers are equally effective.

An experiment to compare the effectiveness of cuprous oxide (Perenox) and copper oxychloride (Blitox) was set up on an area of tea pruned in October for recovery into the North East monsoon. The area was divided into three approximately equal plots, their locations being such that similar conditions prevailed. Two of the plots were sprayed at 10 day intervals with Blitox and Perenox, each at the same concentration of 4 ounces fungicide in 10 gallons of water, application rate being controlled at 12 gallons per acre. The third plot which was not given spray protection, served for comparison in blister incidence between treatments. The experiment continued for nine weeks after bud-break, at the end of which period the plots were ready for tipping. Each spraying was conducted in fine weather and the fungicide dried on the plants before rain fell. Obviously such a condition was ideal for estimating the effectiveness of sticking properties as, if one of the preparations washed off in rain more readily than the other, the results of such leaching would be evident in the degree of infection. The orange colour of the Perenox spray was more readily seen than the green of Blitox on sprayed bushes. During the nine weeks of the experiment there were 34 rainy days with an average of 0.28 inch rain per day. Table 1 shows the degree of infections on pre-tipping growth.

Table 1. *Infections on pre-tipping growth protected by Perenox and Blitox.*

Treatment	Average number of infections per bush on		Average number of dead shoots per bush
	Stems	Leaves	
Blitox	1·1	3·0	0·3
Perenox	0·6	2·5	0·1
Unprotected	12·6	168·5	2·0

Copper fungicide spraying under North East monsoonal conditions. When bright mornings prevail, as is usual under North East monsoonal conditions, spraying of tea recovering from pruning proves very effective. A nine acre plot, kindly placed at our disposal by the Agents and Superintendent of Uda Radella Estate, Nanu Oya, was pruned on 1st September. The area was divided into three plots, one of which remained unsprayed, while the other two were sprayed with Perenox at a concentration of 4 ounces in 10 gallons of water, at weekly and fortnightly intervals respectively. Spraying commenced at the first sign of bud-break on October 10th. The average application rate was 12 gallons per acre for each spraying. Table 2 shows the weight of harvested tippings when the experiment ceased at the end of 1949.

Table 2. *Weekly versus fortnightly spraying.*

Tippings	1st lbs.	2nd lbs.	3rd lbs.	Total lbs.
Weekly sprayed area	423	230	470	1123
Fortnightly ,, ,,	284	288	497	1069
Unsprayed area	148	256	376	780

Taking the weight of tippings of the unprotected plots as a basis for calculation the weekly and fortnightly sprayed areas showed increases of 44 and 37 per cent respectively.

Copper fungicide spraying under South West monsoonal conditions. The possibility of spray protection on areas pruned for recovery under South West monsoonal conditions was demonstrated on a small plot pruned on June 21st.

The sprayed bushes recovered normally with almost a complete absence of stem infections while pre-tipping growth matured with only an occasional blister on a few leaves. The unsprayed bushes were a sorry contrast as they were repeatedly attacked and contained many dead shoots. Good weather in October and November helped recovery but the unsprayed bushes were not ready for tipping until 4 months after the sprayed ones. Similar experiments on a larger scale are planned for 1950.

Loss of Crop. A vexed question is the estimated loss of crop through blister blight attacks. It should be borne in mind that an experiment on St. Coombs is not representative of each and every estate and is probably not representative of St. Coombs as a whole. Some fields due to their location may be more heavily attacked than others and conditions favouring infection will vary considerably from year to year. That fairly heavy loss in crop does occur when blister blight is severe is clear, from an experiment on St. Coombs on an area pruned in December 1948 and brought into plucking on 23rd May 1949. The results given in Table III are for the first year from pruning, but it is intended to continue the experiment for a full cycle.

The experimental area is divided into four blocks each of which consists of three treatments — weekly and fortnightly sprayings with Perenox and an unprotected plot. Spraying of the treated plots is done through a very fine nozzle at an application rate of 8 to 10 gallons per acre, no attempt being made to spray the undersurface of the leaves. Fungicide applications are made irrespective of weather conditions, spraying often being done in rain.

Very heavy infections were observed on the unprotected plots in July and September while the sprayed bushes showed no evidence of die-back which is the main cause of crop losses. Table 3 gives the crop returns over the period May 23rd to December 31st.

Table 3. *Loss of crop due to blister blight.*

Treatment	Crop harvested expressed as pounds dry weight per acre	Percentage increase in crop over unprotected area
Unprotected	328·8	—
Sprayed weekly	414·4	26
Sprayed fortnightly	410·1	25

Chemical analyses show that the spray residue is very high when plucking follows close on the spray application. If, however, a reasonable period of time (8—9 days) intervenes between spraying and plucking, copper residues fall to a low level especially if rain falls during that period. However, until our experiments are completed and reliable data from manufactured tea is available, superintendents are advised, in the interests of the tea industry, not to spray tea in bearing. (*EDITOR'S NOTE.* The position has changed considerably since this was written).

Organic Fungicides. During the year we received samples of organic fungicides from manufacturers in the United Kingdom and America. The modern trend in fungicide research has been directed towards organic formulations to avoid the metallic spray residues. The policy of this Institute has been to keep in touch with manufacturers and to try out their preparations as soon as they are made available. The following organic fungicides were tested against blister blight.

Fermate	(Ferric dimethyl dithiocarbamate)
Zerlate	(Zinc dimethyl dithiocarbamate)
Parzate	(Zinc ethylene bis dithiocarbamate)
Arathane	(Dinitrocapryl phenyl crotonate)
Botrilex	(Chloronitro benzene preparation)
Dithane	(Zinc ethylene bis dithiocarbamate)
Shirlan	(50% salicylanilide)
TMTD	(Tetramethylthiuram disulphide)
Vitospor	(Copper 8-quinolinolate incorporating 60 per cent green sulphur, 10 per cent copper oxychloride and 0.5 — 1 per cent tricresyl phosphate).

Calcium thioglycollate.

Except for the dust, Vitospor, which incorporates copper oxychloride, the preparations showed poor control when compared with Perenox (cuprous oxide). A detailed report on these experiments will be published in the *Tea Quarterly*.

Spray equipment. We can report considerable progress with modifications of a pressure retaining knapsack sprayer to be used in the large scale spraying experiments planned for 1950. As already reported it has been shown that, using special spray nozzles capable of low volume applications, 10—15 gallons of Perenox per acre at a concentration of 4 ounces in 10 gallons of water gives adequate control in tea recovering from pruning. On tea in plucking, using still finer nozzle jets, a very high degree of control may be possible with an application rate of 8 to 10 gallons per acre.

Attempts to spray more than 2 rows of tea with special spray booms proved difficult as shade trees, etc. made manipulation of the spray equipment difficult. Mr. Lane of Plant Protection has designed a boom for spraying two rows of tea simultaneously; though the boom has been ordered as standard equipment on knapsacks it remains to be seen whether efficient cover with the fungicide is possible. Steep slopes and difficult terrain make the apparatus difficult to handle but it will be given a fair trial to test its worth.

Two power driven sprayers, the Allmans' Midget and Drake and Fletcher's Kingston II were received for trial purposes. The Allman's Midget, which is probably the smallest power sprayer yet manufactured, proved more costly to handle than the knapsack sprayer. Messrs. Drake & Fletcher's machine was received late in the year so trials had to be postponed till 1950.

Through the courtesy of Messrs. Harrison Lister Engineering Company, Limited, and the Superintendent of Fetteresso Group, Bogawantalawa, I was able to watch the demonstrations with the Todd Insecticidal Fog Applicator (TIFA). In these trial demonstrations both Perenox and Shell copper oxychloride, the latter in an oil emulsion, were used. No doubts exist on the ability of the machine to form a very efficient fog, which carried for long distances, but copper particles fell out in the first ten yards coating the bushes close to the machine with a thick deposit of fungicide. A full report on those trials has been published in the *Tea Quarterly*, Vol. 20, part 2, June, 1949, pp. 79-80.

Charcoal Rot of Tea. The scientific name *Ustulina zonata*, Lev, by which the fungus which causes Charcoal Rot has been known, is now changed to *Ustulina deusta* (Fr.) Petrak.

Cylindrocladium. It is well known that deficiency of food reserves at the time of clean pruning will result in the failure of the tea bush to make new growth and cause the death of the bush. In the low-country, where starch reserves are insufficiently built up due to more rapid and vigorous growth, clean pruning is seldom adopted, while at elevations above 3,000 feet reasonable food storage makes possible a more severe type of pruning. Bushes failing to recover from pruning due to food deficiencies are usually scattered haphazard through the fields while deaths due to root disease organisms occur in patches.

In the Dimbula area a few estates reported the failure of bushes in definite patches to make headway after pruning. Examination of the roots invariably showed the complete absence of starch reserves. Adjacent sickly bushes, in addition to low starch reserves, were found to be devoid of feeding roots when the bushes were uprooted for examination. A further additional symptom, so far observed only on the starch deficient roots, is the presence of brown lesions of irregular shape and size. These lesions range from minute spots to large patches several inches long. The discoloration of the bark or cortex extends only a few cells deep in small lesions, but the whole depth of cortex is involved in the large patches. Isolations from the small spots and the advancing edges of the large lesions invariably gave rise to pure cultures of a Cylindrocladium fungus, similar in morphological characters to a Cylindrocladium which causes a shoot wilt of varieties of plum and cherry root stocks in the United Kingdom.

Food reserves may be depleted by repeated refoliations following defoliations by disease or other causes. As in some of the larger patches deaths had occurred progressively prior to the advent of blister blight. starvation cannot be attributed to that disease. Starch deficiency or starvation may also be brought about by frequent destruction and replacement of feeding roots by pests or disease. The outcome is the same.

With the destruction of feeding roots foliage in direct communication with the roots die and *vice versa*. The continual process of death and new growth must inevitably be at the expense of stored reserves and starvation is the ultimate result.

It still remains to be proved, whether we are dealing with a new parasitic disease or whether the presence of the fungus, like *Botryodiplodia theobromae*, is the outcome of starvation through other causes. In the meantime diseased bushes should be removed and burnt in an attempt to free the soil of any disease causing organism.

Phloem Necrosis. Reference was made in the 1948 Annual Report of the Pathologist (Bulletin No. 30, 1948, p. 32) to a new symptom of twisted leaves on bushes affected by the phloem necrosis virus. The same symptom of the twisted leaves was observed on estates in the Nanu Oya and Kotmale districts but in these instances the additional symptom of phloem necrosis was not seen.

Gammexane LG. 140. Application of inflammable or odorous insecticides is not possible in factories on stored tea chest timber for fear of fire and tainting of the manufactured tea. Due to this it very often happens that borer infestation becomes very prevalent and causes loss of packing materials when sapu or other soft woods employed in the packing of tea for export are left unprotected. Recently a new preparation "Gammexane Liquid Concentrate LG. 140", an almost odourless solution of the gamma isomer of benzene hexachloride, which can be emulsified in water, with the aid of the emulsifiers Cyclohexanol and Lissapol* has been manufactured by Messrs. Imperial Chemical Industries Ltd. This preparation has been used under laboratory conditions on sapu wood and has shown very promising results against the beetle *Dinoderus minutus*, which is known as a common borer in tea chest timber.

The preparation was tried out at two concentrations — 0.5% and 0.25% made up as follows :—

10 per cent Gammexane	...	64 parts
Cyclohexanol	...	6 parts
Lissapol	...	5 parts

Water was added to dilute the concentrate to 0.5% and 0.25% Gammexane. Sapu blocks 3" × 3½" × ½" were painted as follows on 1.2.1949 :—

2 blocks with 0.5 per cent solution.

2 „ „ 0.25 „ „ „

2 „ „ distilled water (control).

At intervals after storage, batches of *Dinoderus minutus* beetles were placed on the painted blocks for 1, 5, 10 and 15 minutes and then immediately removed to untreated wood for observation on their boring capabilities. The beetles were kept under observation for 4 days to allow

* 'Gammexane LG. 140' has since been superseded by 'Gammexane Emulsion Concentrate', a formulation in which the emulsifying agents are already incorporated.

delayed reactions to be made apparent. The results of the observations made 6 months after treatment of wood blocks are given in Table 4.

Table 4. *Effect on Dinoderus beetles of Gammexane treated wood blocks six months after treatment.*

Block treatment	Duration of time beetles remained on block	Beetles 16 hrs. after treatment			Beetles 4 days after treatment		
		Alive	Moribund.	Dead	Alive	Moribund.	Dead
0·25% Gammexane	1 min.	5	0	0	0	2	3
	5 ,,	5	0	0	0	1	4
	10 ,,	5	0	0	0	0	5
	15 ,,	3	1	1	0	0	5
0·5% Gammexane	1 ,,	0	5	0	0	0	5
	5 ,,	0	5	0	0	0	5
	10 ,,	0	1	4	0	0	5
	15 ,,	0	1	4	0	0	5
Control	1 ,,	5	0	0	5	0	0
	5 ,,	5	0	0	5	0	0
	10 ,,	5	0	0	5	0	0
	15 ,,	5	0	0	5	0	0

Beetles from the control blocks bored into wood very rapidly. No attempt was made at boring by beetles which had been in contact with the Gammexane treated blocks.

The effect of Gammexane treatment began to disappear 7 months after treatment and by the end of 10 months the effect had disappeared. The experimental beetles remained alive on all blocks and were capable of boring.

From these experiments the application of Gammexane LG. 140 at 0.5% BHC strength is recommended, provided due precautions are taken to avoid taint. Duration of effectiveness is reliable for at least six months during which time a borer walking across the treated wood loses its ability to bore and dies in a reasonably short period of time.

Teas stored for six weeks in treated chests, lined with aluminium foil, were reported on as free from taint by three tea tasters.

Cockchafer Grubs (*Anomala* sp.) Cockchafer grubs in the field and nurseries can be controlled effectively by the application of Gammexane powder D.025. The preparation should be lightly dibbled into the soil at the rate of ¼ ounce per square yard. A gum clearing, in which large numbers of the young plants were killed by the feeding of cockchafer grubs, has been effectively treated.

Red Borer (*Zeuzera coffeae*). An exceptionally severe attack of this pest was reported on grevillea trees on an estate in the Dickoya district. Branches 3 to 4 inches in diameter were tunnelled and subsequently broke off in heavy wind. Red borer is also known to attack tea but has not assumed epidemic proportions.

Albizzia Bark Eating Borer (*Indarbella quadrinotata*). In the Southern Province this pest has assumed very serious proportions on a few estates. On one estate infectation was so severe that the growing of *Albizzia moluccana* had to be abandoned.

Bethylus Distigma. A larval parasite of tea tortrix (*Homona coffearea*) was observed and its life cycle has been worked out. It is unlikely that the same degree of control is possible as with the imported parasite *Macrocentrus homonae*. The results of these observations have been described in a paper submitted to the *Journal of the Zoological Society of India*.

The report of the Assistant Pathologist in charge of the Passara Sub-Station follows.

C. A. LOOS,
Acting Pathologist.

REPORT OF THE ASSISTANT PATHOLOGIST, PASSARA SUB-STATION, FOR THE YEAR 1949

Staff. Mr. Fonseka was transferred to St. Coombs from October 9th to end of November for work in the Pathological division in connection with spraying experiments for the control of blister blight.

In March, the designation of the Officer in Charge of the Passara Sub-Station was altered from Assistant Entomologist to Assistant Pathologist.

Advisory. 587 letters were received and 687 despatched. 55 consignments of insects were received for examination and report. Excepting nettle grub in Uva no insect pest of tea was unduly prominent. Important mycological specimens and questions were referred to the Pathological department at St. Coombs.

The increasing interest taken by estates in vegetative propagation of tea was reflected in the number of enquiries addressed to the Passara Sub-Station. Three series of demonstrations were held during the year. Morning sessions were arranged for superintendents and assistants and the afternoons were set apart for estate subordinate staffs. Attendance was satisfactory, a total of 75 and 40 attended the morning and afternoon sessions respectively. Thanks are due to the Plant Physiologist for so generously sparing the services of Mr. Rajiah from St. Coombs to assist in these demonstrations.

Rainfall. At the Gonakele office which is close to the plots of manurial experiment No. 2, 99.76 inches were recorded on 160 rainy days, and at the Sub-station 99.56 inches on 187 rainy days.

Nettle Grub. This caterpillar pest continues to be reported from Uva. Outbreaks, however, were not so severe and extensive as they were some years back. Eleven estates reported the pest at some time or another. Seven of the affected estates were in the Badulla District, 2 round Passara, and one estate each in the Haputale and Madulsima districts. One group was affected continuously for a period of nine months.

Natada nararia, the fringed nettle grub, was the chief species concerned with most attacks. The nettle grub responsible for defoliation in the Haputale outbreak, as in previous years, was *Parasa lepida* — popularly known as the blue-striped nettle grub and originally a pest of coffee.

Two estates resorted to spraying with soap and water as a measure of control, other estates preferred to either hand-pick the grubs or collect cocoons. The Tea Research Institute advocates the collection and destruction of cocoons in preference to other measures to destroy the nettle grub larva or caterpillar.

While only one parasite (a Tachinid fly) has so far been recorded on nettle grub pupae within cocoons, at least 16 species of parasites (Hymenopterous and Tachinid flies) are known to kill the larvae. While an appreciable percentage of larvae are killed by these parasites, the proportion of pupae (within cocoons) destroyed is negligible. Control measures like hand-picking of grubs and spraying which aim at the destruction of

the pest in its larval stage, tend to do more harm than good in that such measures indirectly end in the anhilation of a good proportion of beneficial insects as well.

Shot-Hole Borer. Preliminary experiments carried out on the plots of Passara Manurial Experiment No. 2 to test the efficiency of the insecticides "Guesarol" (a D.D.T. preparation) and "Gammexane" (benzene hexachloride) P. 530 in the control of shot-hole borer, are summarised in Table 2 of the report of the Entomologist for 1946 (Bulletin No. 28, page 32).

Blocks 2 and 4 of the manurial experiment were sprayed with Guesarol and Gammexane respectively at the rate of 1 lb. of the insecticide in 5 gallons water, the amount of spray applied was 113 gallons per acre. Block 3 was left as a control. The first spraying was carried out soon after pruning in September 1946 and the second application 11 weeks later, in December, 1946.

Observations in the early stages of the experiment indicated a decrease in the number of new galleries formed on sprayed bushes against those in the control. This decrease in new galleries denoted that a reduction in the number of broken branches was to be anticipated at the end of the cycle. And since the number of broken branches in a field affords some indication of the shot-hole borer attack, as branches would not normally break unless previously affected by the borer, a count was made of all breakages in the cycle.

The first count was made in May 1947. From then onwards regular weekly counts were recorded at each plucking till the field completed its 3 year cycle.

A statistical study of the data collected indicated that while a decrease in breakages from the block treated with Guesarol was not very significant, an appreciable reduction in damage approximating to 31% was evident in the Gammexane block.

These results corroborate an observation made by T. E. Snyder — the U.S.A. Entomologist that "benzene hexachloride is better than D.D.T. against ambrosia beetle"*. Tea shot-hole borer is an ambrosia beetle.

The above experiment with insecticides is being repeated in 1950.

Parasites and Predators. Very little is known of our beneficial insect-like parasites and predators whether found on insects of major or minor importance. The few records available are invariably hidden away on cards and only referred to should a host suddenly assume the status of a pest.

At the 5th Commonwealth Entomological Conference held in London during 1948, a delegate suggested "that a very useful object would be attained by officially sponsored work in the Commonwealth to study the parasites and predators of insects that may not be pests in the country concerned. A wealth of data would thus accrue that could be turned to advantage. The work would be one of reciprocity each country benefiting not so much from its own work as from the work of others"**.

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* "Insects in Wood" by T. E. Snyder in Year-Book of U.S.A., Department of Agriculture, for 1949, page 435.

** Report of the Fifth Commonwealth Entomological Conference 22nd—30th July, 1948, London.

A comprehensive list of all the known recorded parasites of insects attacking tea and other crops associated with the tea industry is in course of preparation.

A list of beneficial insects observed during the year is given below under their respective hosts. Further additions will be made in future annual reports for record purposes.

Tetranychus sp. (Tetranychidae). Both adults and larvae of a Coccinellid and a Staphylinid beetle were observed to feed on all stages of the mite. A dipterous maggot was noticed to feed on the nymphs only.

Paratetranychus (Tetranychus) bioculatus W.M. Red Spider (Tetranychidae). A Coccinellid beetle (same as the species feeding on Tetranychus sp. on Crotalaria, etc.), was found feeding on red spider on tea. The Coccinellid larvae too were predaceous on all stages of the mite. In the laboratory the beetles also fed on scarlet mite, *Brevipalpus australis* Tucker, but refused yellow mite, *Hemitarsonemus latus* (Banks) Ewing, and the purple mite, *Eriophyes* (*Phytoptus*) *carinatus* Green. *Argina argus* Koll & A. *syringa* Cram (Hypsidae). An egg parasite (*Telenomus* sp.) was obtained from both species of *Argina* at St. Coombs and at Passara. The bionomics of these minute parasites are being studied at St. Coombs.

A Tachinid pupal parasite, was recorded from *A. argus* at St. Coombs and Passara.

Arctia ricini F. (Arctiidae). A species of *Meteorus* (Braconidae) was observed to parasitise the young caterpillars of *A. ricini* on *Crotalaria agathifolia* at Passara. Its bionimics are being studied and data gathered so far indicate that it is a solitary larval parasite with a development period (egg to adult) lasting 16—21 days, pupal period 8—11 days. In captivity two females lived 79 and 83 days when fed on droplets of sweetened water.

A Tachinid fly parasite was bred from the pupa of *A. ricini* also at Passara.

Natada nararia Mo. (Limacodidae). Observations were continued on the Braconid, *Rogas* sp., a solitary larval parasite of the Limacodids *Thosea cervina, T. recta, Narosa conspersa* and *Natada nararia*. Its life history as recorded at Passara on the last named host is as follows :—Egg stage one day, larval stage 5—13 days, pupal stage 7—9 days. One female was maintained in the laboratory for as long as 93 days.

Diseases. In addition to the commoner diseases of tea like blister blight, Rosellinia, Poria and brown root disease, which were occasionally reported during the year, a disease which caused a certain amount of concern was a dieback of tea branches during the first year from pruning. The fungus responsible for this dieback was identified by the Acting Pathologist as *Leptothurium theae*. The disease was first recorded in Dimbula in 1929. Though reported for the first time in Uva, 20 years later, it is probable the disease was present in the Province much earlier, but not so noticeable as last year.

Extensive scorching of foliage due to excessive applications of fertilisers was reported twice.

Blister Blight. Loss of crop experiment. Towards the middle of the year the Acting Pathologist decided that there was nothing to be gained

by prolonging the experiment owing to the poor incidence of blister blight on the experimental plots.

Lime-wash experiment. This field experiment, the purpose of which was to ascertain the effect of lime-wash on pruned tea, was carried out on Gonakele Estate in a field which had completed a three-year cycle (elevation of 3,500 feet).

The experiment consisted of the following treatment :—

1. Untreated.
2. Cleaned with jute hessian only.
3. Cleaned with jute hessian and lime-washed.
4. Lime-washed only.

Bushes were lime-washed at the rate of 4 cwt. lime per acre early in May after the normal estate sanitary treatment a couple of days earlier. Examinations consisted in making a count of new buds as they appeared and their position on the bush noted whether on old wood or new wood. Two examinations were recorded 30 and 40 days after lime-wash was applied.

The Plant Physiologist who initiated the experiment reported as follows on the results :—"The effect of lime-washing in producing an earlier bud-break on the old wood is highly significant but there is no significant increase in the final number of buds produced. Contrary to expectation there is no effect of cleaning with hessian."

The experiment is to be repeated in 1950.

Passara Manurial Experiment. This experiment completed its three-year cycle with the 136th plucking in September 1949. The Plant Physiologist, who over-looked the experiment following the departure of the Agricultural Chemist, decided, after a study of the records to postpone pruning till March 1950 and rest the tea in the interval. Further notes on the results of this experiment are incorporated in the report of the Plant Physiologist.

Green Manures and shade trees. The following were established at the Sub-Station; bush crops were grown on demonstration plots close to the laboratory :—

Tephrosia noctiflora. Seed was supplied by the Department of Agriculture, Peradeniya. Growth rather poor at Passara.

Tephrosia candida. Growth very satisfactory.

Tephrosia vogelii. Growth equally satisfactory.

Crotalaria anagyroides. Growth satisfactory. Foliage very susceptible to attack by the flea-beetle, *Longitarsus* sp. Popular as a green manure in Uva.

Crotalaria usaramoensis. Growth as good as *C. anagyroides* and equally susceptible to flea-beetle attacks.

Crotalaria brownei. Seed received from the Peradeniya Government Experiment Station. Grows luxuriantly at Passara. Leaves very susceptible to attack by the disease *Parodiella grammodes*, which fortunately does little or no harm.

Crotalaria lanata. Seed received from St. Coombs. Young seedlings were attacked by hare and the plants never established.

Crotalaria grahamiana. Growth very satisfactory at Passara and wherever it is grown in Uva in spite of attacks by flea-beetle and the two caterpillars *Argina argus* and *A. syringa.*

Crotalaria agathifolia. Seed from St. Coombs. Germination very poor. The only plant which survives in the grounds is two years old and 11 feet high. It has not flowered yet. Though susceptible to attack by flea-beetles it was not visited by the *Argina* caterpillars.

Sesbania cannabina. Seed received from Department of Agriculture, growth very poor.

Sesbania cinerescens. These species continues to grow luxuriantly at Passara. It can reach a height of 15 feet and is very resistant to the Uva winds.

Indigofera arrecta. Seed from the Department of Agriculture. Germination very poor.

Desmodium gyroides. Seed from Department of Agriculture. Growth satisfactory. Plants were attacked by the fluted scale, *Icerya purchasi.*

Tecoma Stans. Grows luxuriantly on the station. Unlike in Dimbulla where it is grown rather extensively in tea, in Uva it is considered more as an ornamental tree owing to its bright yellow flowers.

Calpurnia aurea. Several enquiries were received regarding this tree which appears to be gaining popularity in Uva. It is said to stand light lopping and produce high shade similar to that given by a large dadap. A factor in its favour is that cattle and goats will not touch it. A disadvantage is that it is liable to self-seed. There was no difficulty in establishing it on the Sub-Station grounds.

Pests of Green Manures.

Crotalaria caterpillars. There are two species of Argina caterpillars which attack Crotalarias — *Argina argus* and *A. syringa* (Hypsidae). The full grown caterpiller of *argus* is about two inches long, black with a line of white spots along the middle of the back, while those of *syringa* are dull-greenish-grey, with transverse series of narrow black bands, three on each segment of the body. The report for 1948 contained an account of *Argina argus* as a pest of *Crotalaria grahamiana* at St. Coombs. Last year this caterpillar turned out to be a serious pest of *Crotalaria grahamiana* wherever this green manure was grown in Uva. At Passara its life-history was worked out and is summarised as follows :—Eggs hatch in 7 days, the larval or caterpillar period 22—24 days, pupal period 12—14 days. Moths are capable of living a couple of weeks and one female was recorded to lay 678 eggs. *Argina argus* is also recorded to feed on *Crotalaria agathifolia, C. saltiana* and *C. semperflorens.* The last two hosts are Peradeniya records.

Another hairy caterpillar, but belonging to the family Arctiidae was observed feeding on *C. agathifolia.* It was identified as *Arctia (Pericallia) ricini.* This caterpillar is a serious pest of several plants of economic importance. The full grown caterpillar is about 2 inches long, dark-brown or blackish and thickly covered with fine long reddish brown hairs. It is inclined to hide under leaves but is very active when disturbed. It pupates in a thin flimsy cocoon. At Passara its life-history is as follows :—Egg stage 12 days, larval period 40—60 days, pupal period 27—30 days.

G. D. AUSTIN,

Assistant Pathologist, Passara Sub-Station.

REPORT OF THE SMALL HOLDINGS ADVISORY OFFICER, GAMPOLA, FOR THE YEAR 1949

Competitions amongst small holders in tea have had their measure of success in bringing home to small holders the importance of improved methods of cultivation of their respective tea holdings. These inducements create a certain amount of healthy rivalry in the villages and amongst the small holders and a large number take part.

Due to the lack of funds prizes have of necessity to be curtailed. The practice has been to offer three cash prizes to a group of villages, which is termed a Korale and may consist of twenty or twenty five villages. The Village Committees of the different areas have been most helpful and have made very generous contributions towards these cash prizes with the meagre funds at their disposal.

The outcome of these competitions is that, with regular and systematic work, the owners themselves soon begin to realize how beneficial it is to them to maintain their holdings in a good agricultural condition. When once this advantage is realized and appreciated by small holders our task is made easier. Further he becomes a very useful instrument of propaganda from our point of view, with mutual benefits, as the small holder takes in ideas more readily through the eye than through the ear.

The ultimate result of these competitions is that we have, by these means, virtually established demonstration blocks in practically every village.

In addition to the organisations of competitions, regular visits are paid to most areas and every encouragement is given to maintain and extend improvements in the holdings. The maintenance of improvements is the biggest problem at the present time. To solve this problem the economic condition of small holders must be improved or some safeguards to their interests should be established.

Safeguards, such as a guaranteed fair price for green tea leaf, and assistance with supplies of artificial manures, tea seeds and working tools should give good results. These developments can only be achieved through co-operative movements which at present are unknown to tea growers.

The Co-operative Movement. There are several ways in which this movement could be of immense help to the small-holder — such as a green leaf sales society and a co-operative tea factory, for the manufacture of the small holders' leaf. A move was made and several conferences were held during the year and every detail worked out in respect of a tea factory. I presume the scheme was not undertaken as the initial cost seemed prohibitive, but in actual fact, figures worked out showed that though the initial expenditure would be heavy, there were possibilities of recovering this heavy expenditure in a very short period, while giving the small holders the benefit of such a scheme.

I understand there are several co-operative movements amongst the coconut growers. They have more than justified their existence and proved most beneficial to the grower and the miller. In a small area, within a few square miles of Kadugannawa, Gampola and Peradeniya, there exist

over twenty bought leaf factories, all depending on the small holders' leaf. They have sufficient leaf for their requirements, and more at certain periods of the year. The shortage exists only for a very short period, that is, during the early part of the year, the three dry months.

A co-operative factory deserves careful consideration as the benefits that will ultimately come to the small holders would be numerous. To state a few advantages, the productivity of small holdings could be increased considerably by the supply of artificial manures through these institutions. The big problem of soil erosion which affects the tea small holdings most, could be tackled more satisfactorily; the supply of tea seed which is most difficult to obtain, even at a price, at present, could be satisfactorily solved. This brings us to the question of the very valuable planting material that is being stolen from estates (I refer to the vegetative propagation plants) which could be prevented. A project of this nature will help the small holders to realise the best prices for their green leaf. This will help in a great measure to make them economically sound which should be our aim. If economically sound they would, in turn, be better paddy cultivators and avoid the haphazard methods now practised due to economic conditions rather than ignorance.

Competitions. The competition organised in the latter part of 1947 amongst small holders in Udu Nuwera was brought to a close in February this year. The keenness shown and the progress made throughout the year was most encouraging.

Within a few months of the competition, most of those taking part realised the importance of regular and good work, the tea responding to systematic work by giving increased yields. This keenness and enthusiasm lives, unfortunately, only for a short period in the majority of cases. As long as there is constant supervision and some encouragement the progress is maintained. This is directly a result of the economic conditions of small holders — not having the resources to tide over any unforeseen expenditure, which may be caused through an illness or some such mishap.

The prize distribution took place early in March. We had with us Mr. T. B. Panabokke (Jr.), Member of Parliament for this area, Mr. R. C. Scott, C.B.E., Chairman of the Board, and Dr. Roland V. Norris.

Mr. Panabokke very kindly consented to give away the certificates and cash prizes.

In this connection, I am most grateful for the assistance given me by the Village Committee Chairmen and Members and for their very generous contributions towards the prize money. Each village committee area contributed Rs. 50/-.

Demonstrations. A very useful purpose is served in carrying out practical demonstrations on small holdings. The one branch of the growing of tea where small holders need most help is "pruning." Every attempt is made to be present on small holdings at pruning times — small holders are requested to inform me when their fields are due for pruning. When such an opportunity arises, a convenient date is fixed and as many small holders as possible in the neighbourhood are informed of my intended visit. I have had as many as fifteen small holders present at these demonstrations. They are most interested, being in familiar surroundings, ask questions and try their hand at pruning. The "rim-lung" method of pruning is always advocated as the best method.

This type of meeting affords an opportunity for discussing each individual's problems and a free discussion takes place. This personal contact is most helpful in carrying out this type of work and winning the confidence of those worked with.

The opportunity is also taken to demonstrate the various methods of draining. 64 such demonstrations were carried out during the year in 47 different villages.

Meetings. Thirty eight meetings were attended during the year. They consisted of co-operative society meetings to promote the welfare of the small holders, rural development society meetings and meetings of small holders in tea in the various areas. In this connection a majority of the rural development societies are doing good work in the villages, and their usefulness is being appreciated by the people with the result that they are growing popular.

Advisory correspondence. 346 letters were received and 269 despatched.

Fertilisers. Since the rationing scheme was lifted the demand for this type of manure has also decreased considerably. The more progressive small holders still continue to get their manures through me.

Vegetative Propagation. A number of small holders have taken to this method of growing tea, and several demonstrations have been carried out on small holdings.

Blister blight. This disease has not seriously affected the Gampola area except for very limited areas. The Gampola district small holder need hardly worry about it. Advice on measures to check the incidence of this disease has been given to owners whose holdings were affected.

Tea Seed. Considerable difficulty is found in procuring tea seed, even at a price. The prices paid for a maund of tea seed is so high that it is beyond the reach of a majority of small holders.

If estates producing tea seeds would co-operate in a scheme whereby they contribute a certain percentage of their crop to a central bureau for sale to small holders, the acute shortage of tea seed could and would be solved to the mutual benefit of all concerned, and thefts would be reduced to a minimum.

Just at present it is most important that thefts should be minimised as most estates have after considerable expense started on vegetative propagation on an extensive scale.

General. Conditions continue to improve. The tea prices were fairly steady throughout the year and gave small holders a reasonable profit.

The weather conditions were also normal which resulted in good paddy harvests being gathered.

I have once more to convey my sincere thanks to the Chief and Minor Headmen, Village Committees and those who have given me their co-operation and assistance in my work.

R. L. ILLANKOON.
Small Holdings Advisory Officer,
Gampola.

REPORT OF THE SMALL HOLDINGS ADVISORY OFFICER, MORAWAK KORALE, FOR THE YEAR 1949

Weather. Records maintained at Waralla in Morawak Korale showed a rainfall of 125.38 inches in 1949, as against 158.35 inches the previous year. The distribution of rain was fairly even and proved beneficial for crops.

Advisory work. The major part of my time was devoted to advisory work in Morawak Korale, the chief tea district of my division. Nevertheless, I also kept in touch with the other tea growing areas in the Southern Province to stimulate interest among those engaged in tea cultivation.

176 individual holdings were visited for the purpose of advice. Crop records were maintained for holdings where owners followed my instructions and in such instances definite improvements in terms of increased crops were observed.

A good number of larger holdings were visited at the request of the owners and many matters pertaining to tea cultivation were closely discussed.

Particular attention was given during the pruning season to get the tea growers to adopt light pruning leaving lungs. Better plucking was explained with a view to maintaining prices for manufactured tea.

Small Holders' Union. Lack of capital for manures and tea seed, inadequacy of implements, etc., made the life of the average small holder one of some difficulty. With a view to overcome these difficult working conditions by co-operative means, I endeavoured to get the small holders to form into a union, and finally on the 12th December, 1949, the association was formed at Morawaka.

Competitions. In order to induce adoption of better cultivation methods a competition was organised for those owning under 10 acres of tea. This was approved by the Director, Tea Research Institute, in October 1949, and will run for a period of one year beginning in January 1950 Six cash prizes are to be offered at the end.

Propaganda. Convincing a crowd is always easier than when each individual from the same crowd is dealt with separately, and for the purpose of suggesting better methods of work to the small holders, propaganda meetings proved useful. 8 such meetings were held in various tea growing areas during the year. These meetings were widely advertised in order to attract the maximum number of small holders.

In the early part of the year when people rushed through planting up their bare patches indiscriminately before the Tea Control Act of 1949 was enacted, it was the most difficult time to get any systematic work done. I had to work very hard to induce them to adopt contour planting. With the co-operation of a few tea growers I maintained successfully a few demonstration plots on the contour system in different parts.

Other Activities. I visited several estates in the district in order to study the varying working conditions and in many instances such visits and the subsequent discussions proved to be of mutual benefit.

I also attended various welfare society meetings whenever time permitted. These visits enabled me to meet the country people in their own sphere and thus come to a closer understanding with them.

In order to keep in touch with planters and planting matters I made it a point of attending every P. A. meeting in the district.

Remarks. The year proved to be one of prosperity to most tea growers. In the Morawak Korale prices paid for green leaf varied between 24 — 45 cents per pound and 25½ — 55 cents in the Galle district. The average price per pound in the former was 31.8 cents and 33.7 cents in the latter.

Acknowledgments. I offer my sincere thanks to Mr. Victor Ratnayake, M.P., Deniyaya, and Mr. R. Brodie, Chairman, Morawak Korale P.A., for the very keen interest they showed in small holdings work. My thanks are also due to District Revenue Officers, Morawak Korale, V.C. Chairmen and members and the Village Headmen for the assistance given to me in the discharge of my duties and thereby making my task more pleasant.

I make special mention of the Tea Propaganda Board for sending down a caravan to serve tea at a largely attended meeting of small holders at Hinidum Korale.

K. P. ABEYEWICKREMA,
Small Holdings Advisory Officer,
Morawak Korale.

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The Tea Research Institute of Ceylon

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(5) Mr. F. A. Bond.

(6) Mr. W. H. Attfield.

(C) Representing the Low-Country Products' Association :—

(7) Mr. W. Neal de Alwis, J.P., U.M.

(8) Mr. Leo B. de Mel, J.P., U.M.

(9) Mr. Errol Jayawickrema.

(D) Representing the Small-Holders :—

(10) Mr. S. Vytilingam.

(E) Ex-Officio Members :—

(11) The Hon. the Minister of Finance or his Nominee.

(12) The Director of Agriculture.

(13) The Chairman, Planters' Association of Ceylon.

(14) The Chairman, Agency Section, Planters' Association of Ceylon

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Secretary, Roland V. Norris, D.Sc., St. Coombs, Talawakelle.